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CameraManSTUDIO

PRELIMINARY SALES MANUAL

CONFIDENTIAL

SSM-963-01 9.25.96 kkm

Introduction

Description

CameraManSTUDIO™ is the first PC based studio production system to combine Digital Video Effects, Digital Audio Mixing, VCR control, and CameraMan™ camera robotic control systems into one interface. This interface allows one person control of all the elements in a "live" video production. Combining all the control elements into one interface allows CameraManSTUDIO™ to automate control between Video Effects, Audio Mixing, VCR control, and Camera control.
CameraManSTUDIO™ has a unique proprietary feature called *Transition*Macro™ which allows ~~for the recording of~~ THE CREATION OF real time control sequences. A control sequence can include Video effects, Audio mix, VCR commands, and Camera control. The *Transition*Macro™ can then be assigned to a single button for playback and can also be edited using a simple ~~text commands~~. GUI EDITOR.
A ~~joystick controller~~ SHOT PROFILER option is available for the CameraManSTUDIO™ system to allow for independent remote camera control. The ~~joystick controller~~ SD provides pan, tilt, zoom, focus, and iris control of up to six cameras in real time. A camera position (called a preset) can be stored in the memory of a CameraMan base unit and recalled using the ~~joystick controller.~~ SD Custom autoTRACK™ views can be stored in the base unit memory and recalled from the autoTRACK™ version of the ~~joystick controller~~ SD. An LCD is provided for system status and setup information. The ~~joystick controller's~~ SD most powerful feature is it's ability to adjust camera setup functions on any camera in the system. With this feature built into the ~~joystick controller~~ SD there is no need for each camera to have a CCU.
With the ~~Joystick controller~~ SD, a feature called ShotPROFILER™ will allow the joystick movements to be recorded. These movements can then be played back and edited from the CameraManSTUDIO™ system. Combining a shot profile with a *Transition*Macro™ will create a very complex transition with an automated camera move.
The CameraManSTUDIO™ is configured and priced with two CameraMan™ systems. CameraMan™ systems can be single or three CCD and autoTRACK™ or non- autoTRACK™ depending on the application and the customer needs.

Target Market

The target market for CameraManSTUDIO™ is corporate video production. CameraManSTUDIO can be used in other industrial user markets such as healthcare video production, government video production, and education video production. One advantage to the CameraManSTUDIO system is the reduced number of personnel required for operation. This appeals to corporate video departments that are resource limited. Another advantage is leveraging the power in a PC platform to allow automation of redundant production tasks for ease of use.

Corporate video production users will typically install a small studio consisting of two to three cameras. These studios are used to produce training videos, promotional videos, policy videos, and any other video information to be distributed. These studios can also be used to originate live video feeds to be broadcast via satellite, RF broadband, and public switch network. The type of VCR's and monitors used in these systems will vary depending on the end users budget. CameraManSTUDIO can be used in auditoriums or remote locations that require image magnification, broadcasting, recording of special corporate events.

Health care users will install small studios like those used in corporate video production for the recording and distribution of medical processes. In addition to the small studio, operating rooms can be equipped with a system to broadcast from the operating room. Auditoriums can have systems installed for image magnification, recording, broadcasting of lectures or special events.

Government users which include the military will also install small studios like the corporate user and produce many of the same videos. In addition, systems will be installed to broadcast proceedings from the council chambers of local governments, state legislative floors, state and federal courtrooms. Law Enforcement will use the CameraManSTUDIO for training videos in a production studio environment.

Academic users have two methods of teaching video production, one is to train students on the use of video production equipment, the other is teaching how to produce a video. The later of these two requirements is well suited for CameraManSTUDIO because the emphasis is on how to produce a finished product rather than the mechanics of producing the video. CameraManSTUDIO is the most efficient way to produce a live video. Video material can be produced by a single student if necessary. When teaching the mechanics of video production it is desirable to involve as many students as possible with each student concentrating on one aspect of the production. This requires a multiple station studio which is not supported at this time. But we believe the future trend is away from multiple stations for video production in small studios, and toward an integrated system that gives greater operating capabilities to one or two people. CameraManSTUDIO can be used in auditoriums that require image magnification, broadcasting, recording of lectures or special events. Education can also use the CameraMan studio for distance learning and video production of teaching tapes.

Others will find a use for the CameraManSTUDIO such as Religious Broadcast and studio productions, Small cable and Broadcasting facilities. There application typically will be live video broadcast via local broadcasting, Cable TV, or Satellite.

Product Roll Out

The initial product roll out plan for CameraManSTUDIO is to establish a reseller network and create product awareness in the marketplace. The first step is to establish and train a network of qualified resellers that will sell, install, and service the CameraManSTUDIO to end users. These resellers will be responsible for providing additional equipment required to complete a turnkey system. The reseller will be factory trained in all aspects of the CameraManSTUDIO. The next part of the product roll out plan is to create product awareness. This will be accomplished through trade shows, ad placements in major publications, and direct mailings. Please see the schedule below.

TRADESHOW	DATE	PLACE
National Association of Broadcasters	4/97	Las Vegas, NV
Infocomm International	6/97	Los Angeles, CA
IBC Europe	10/97	Amsterdam, Netherlands

PUBLICATION	DURATION	DISTRIBUTION
A/V Video	6X	Video Professionals
Video Systems	6X	Video Professionals
Videography	6X	Video Professionals
Broadcast Engineering	2X	Video Professionals
TV Technology	2X	Video Professionals
Broadcast Television	2X	Video Professionals
NAB Daily	6X	Show Attendees
NAB Program	1X	Show Attendees
Asia Pacific Broadcasting	3X	Video Professionals (International)
TVB Europe	3X	Video Professionals (International)
THE Journal	3X	Education
Technology and Learning	2X	Education
Curriculum Administrator	2X	Education
Media Methods	2X	Education
GMV	3X	Government

Competitive Analysis

It is difficult to provide a competitive analysis for the CameraManSTUDIO because it is such a unique product. It is the only PC based live video production system available today. To compare this system we must look at what components are available from other manufacturers with similar feature sets and combine them to form a comparable system. Below you will find these systems listed. The first system is based on current Panasonic equipment. The second system is based on current Sony equipment. The third system is a very inexpensive system design. The fourth system you will find a traditional turnkey system design which includes a console, rack and other equipment. Finally you will find the CameraManSTUDIO non-tracking version of each camera type.

PANASONIC 3-CCD STUDIO CONFIGURATION

COMPONENT	MANUFACTURER	MODEL	PRICE
Digital Switcher	Panasonic	ASD-700	$ 28,500.00
Analog I/O 4in/2out	Panasonic	AS-A701	$ 4,000.00
Chroma Key Unit	Panasonic	AS-A704	$ 3,800.00
Shadow Generator	Panasonic	AS-A705	$ 3,000.00
Video Effect Interface	Panasonic	AS-A706	$ 3,300.00
Rack Mount Adaptor	Panasonic	AS-A708	$ 100.00
Memory Card	Panasonic	AS-A709	$ 80.00
Analog Proc Rack	Panasonic	AS-A720	$ 4,000.00
		sub-total	$ 46,780.00
Audio Mixer 8in/2out	Panasonic	WR-133	$ 1,470.00
Mixer rack mount	Panasonic	WR-Q51	$ 100.00
Pan/Tilt Cam	TSM		$ 22,570.00
Pan/Tilt Cam	TSM		$ 22,570.00
			$ 93,490.00

SONY 3-CCD STUDIO CONFIGURATION

COMPONENT	MANUFACTURER	MODEL	PRICE
Digital Switcher	Sony	DFS-300	$ 10,700.00
Audio Mixer 8in/2out	Sony	MXP-290	$ 4,300.00
Mixer Rack mount	Sony	MXBK-200	$ 112.00
Pan/Tilt Cam	TSM		$ 22,570.00
Pan/Tilt Cam	TSM		$ 22,570.00
			$ 60,252.00

TRADITIONAL 1-CCD Pan/Tilt SCHOOL STUDIO SYSTEM

COMPONENT	MANUFACTURER	MODEL	PRICE
Digital A/V Mixer	Panasonic	WJ-MX50	$ 5,000.00
Pan/Tilt Cam	Telemetrics	PT-CP	$ 18,249.00
Pan/Tilt Cam	Telemetrics	PT-CP	$ 18,249.00
			$ 41,498.00

TRADITIONAL SCHOOL 1-CCD STUDIO SYSTEM

COMPONENT	MANUFACTURER	MODEL	PRICE	QTY	EXTENDED PRICE
S-VHS Camcorder	Panasonic	AG-456U	$ 2,495.00	2	$ 4,990.00
Power Supply	Panasonic	AG-B21	$ 150.00	2	$ 300.00
A/C Adaptor/Charger	Panasonic	AG-B6	$ 180.00	1	$ 180.00
Rechargeable Batteries	Panasonic	AG-BP20	$ 60.00	2	$ 120.00
RF Adaptor	Panasonic	VW-RF7	$ 60.00	1	$ 60.00
Tripod W/Fluid Head	Bogen	3118	$ 421.95	2	$ 843.90
Dolly	Bogen	3067	$ 272.00	2	$ 544.00
20" Color Mon/Rcvr	Panasonic	CT-2084VY	$ 475.00	1	$ 475.00
A/V Cart	Bretford	MP30-E4	$ 243.00	1	$ 243.00
Microphone	Sony	ECM-44B	$ 245.00	2	$ 490.00
Microphone	Electro-Voice	635A	$ 149.00	2	$ 298.00
Mic Desk Stand	Atlas	DS-7E	$ 28.35	2	$ 56.70
Portable Light Kit	Lowel	Omni-4	$ 1,575.00	1	$ 1,575.00
Lamps	Lowel	FTK	$ 19.50	8	$ 156.00
Video Editing System	JVC	VES-22DX	$ 17,300.00	1	$ 17,300.00
A/V Mixer/ Effects Gen	Panasonic	WJ-MX30	$ 2,650.00	1	$ 2,650.00
CG/Titler	Panasonic	WJ-KB30	$ 440.00	1	$ 440.00
Audio Mixer	Tascam	M-108	$ 849.00	1	$ 849.00
B/W Monitor	Sony	PVM-97	$ 470.00	3	$ 1,410.00
Mon Rack Kit	Sony		$ 110.00	2	$ 220.00
14" Color Mon	JVC	TM-1400SU	$ 875.00	2	$ 1,750.00
Mon Rack Kit	JVC	RK-1400	$ 150.00	2	$ 300.00
Audio Amp	Symetrix	420	$ 369.00	1	$ 369.00
Speaker	JBL	Control 1	$ 133.00	4	$ 532.00
Speaker Mount	JBL	MTC-2	$ 40.00	2	$ 80.00
Speaker Mount	JBL	MTC-3	$ 40.00	2	$ 80.00
I-COM Belt Pack	RTS	BP317	$ 195.00	4	$ 780.00
I-COM Power Supply	RTS	PS15	$ 350.00	1	$ 350.00
I-COM Rack Kit	RTS	MCP-2	$ 25.00	1	$ 25.00
I-COM Headset	RTS	PH2-R4	$ 145.00	4	$ 580.00
Audio Cassette	Tascam	102	$ 349.95	1	$ 349.95
CD Player	Tascam	CD-301	$ 699.00	1	$ 699.00
Video DA	Videotek	VDA-16	$ 306.00	1	$ 306.00
Audio DA	Videotek	ADA-16	$ 306.00	1	$ 306.00
Rack Frame	Videotek	DAT-1	$ 99.00	1	$ 99.00
Rack Mount Kit	FEC	RKS 822U	$ 150.00	2	$ 300.00
Console	Winsted	K8552	$ 4,903.00	1	$ 4,903.00
Blank 1RU	Winsted	85140	$ 6.00	4	$ 24.00
Blank 2RU	Winsted	85141	$ 7.00	2	$ 14.00
Blank 6RU	Winsted	85145	$ 8.00	1	$ 8.00
Blank 9RU	Winsted	85148	$ 9.00	4	$ 36.00
Blank 11RU	Winsted	85149	$ 10.00	3	$ 30.00
				Sub-Total	$ 45,121.55
Misc Cable	Custom		$ 4,512.16	1	$ 4,512.16
				Total	$ 49,633.71

PARKERVISION 3-CCD STUDIO CONFIGURATION

COMPONENT	MANUFACTURER	MODEL	PRICE
CameraManSTUDIO	ParkerVision	CSS-2000-G2	$ 44,995.00
CameraManSTUDIO	ParkerVision	CSS-2313-G2	$ 69,995.00
CameraManSTUDIO	ParkerVision	CSS-2317-G2	$ 79,995.00

Application Drawings

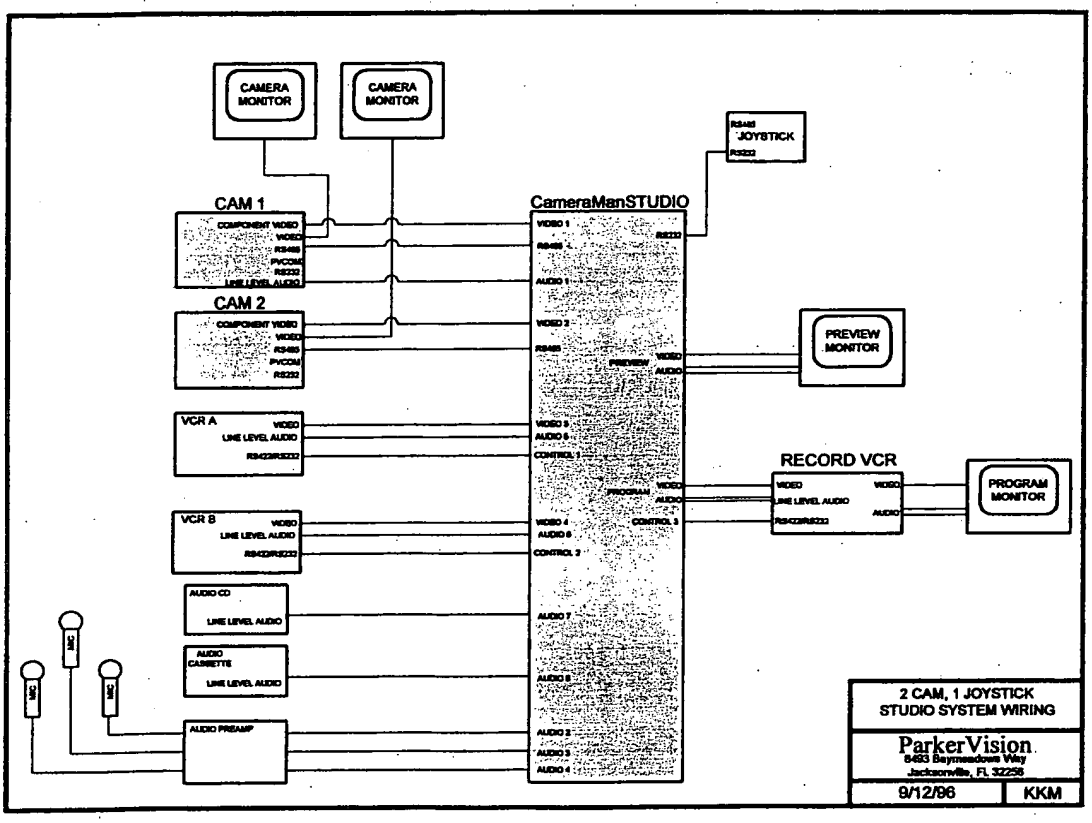

Figure 1 Two Camera System with Joystick

NOTE: Shaded areas are components provided by ParkerVision. All audio sources are single channel.

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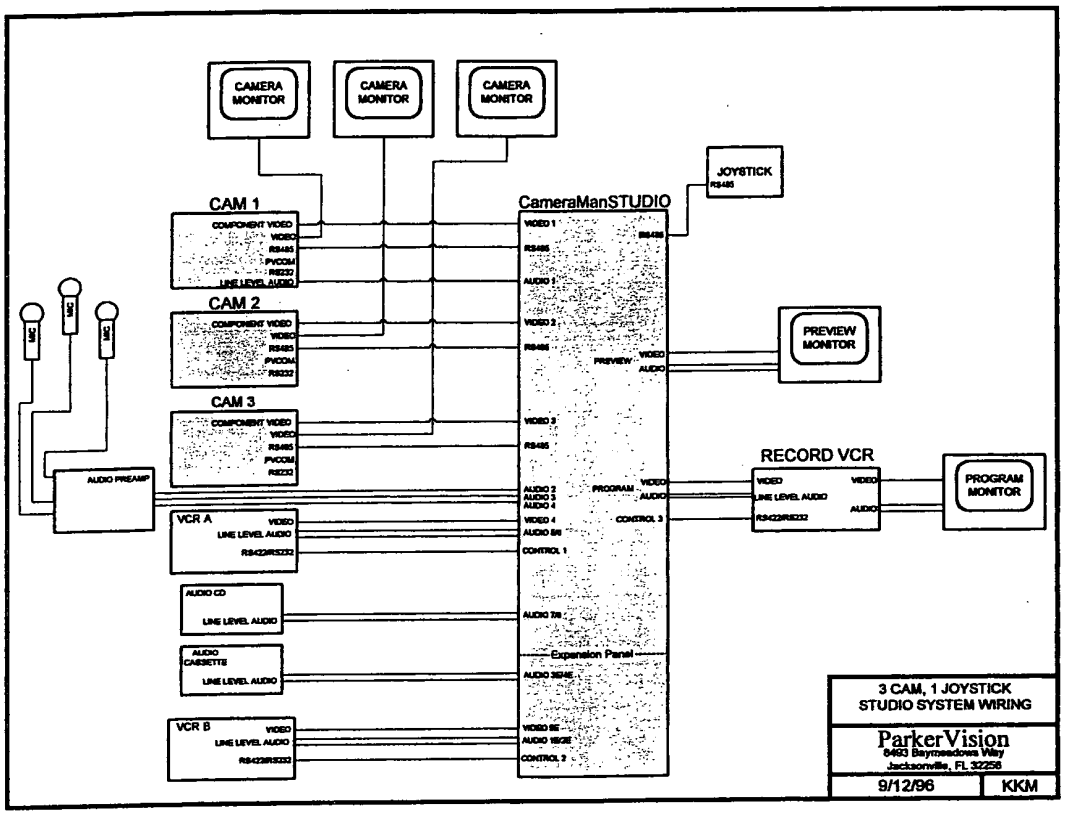

Figure 2 Three Camera System with Joystick

NOTE: Shaded areas are components provided by ParkerVision. All audio sources are dual channel.

Product Line and Specifications

The CameraManSTUDIO product line consists of several different system configurations and peripherals to enhance the basic system performance. The basic system shall consist of two cameras, rack mount PC with processing boards installed, 17" color SVGA monitor, keyboard, mouse, rack mount I/O box. The PC is provided with all software installed, cameras are provided in different variations of type and lens configurations. Camera's can be sold separately with the joystick or camera control software for those systems that do not require the studio. Following is a chart of the available products, scheduled release dates, and pricing.

MODEL #	DESCRIPTION	RELEASE DATE	LIST PRICE
	1-CCD PAN/TILT CAMERA		
CPT-2000-A1N	NTSC, Pan/Tilt, 1-CCD, Camera System	1/97	$ 4,995.00
CPT-2000-A1N	Int'l, NTSC, Pan/Tilt, 1-CCD, Camera System	1/97	$ 5,995.00
CPT-2000-A1P	PAL, Pan/Tilt, 1-CCD, Camera System	1/97	$ 6,995.00
	1-CCD PRESENTER CAMERA		
CPC-2000-A1N	NTSC Presenter Camera System	1/97	$ 7,995.00
CPC-2000-A1N	Int'l, NTSC, Presenter Camera System	1/97	$ 8,995.00
CPC-2000-A1P	PAL Presenter Camera System	1/97	$ 9,995.00
	3-CCD, 13X LENS, PAN/TILT CAMERA		
CPT-2013-A3N	NTSC Pan/Tilt, 3-CCD, 13X Lens, Camera System	1/97	$ 18,995.00
CPT-2013-A3N	Int'l, NTSC Pan/Tilt, 3-CCD, 13X Lens, Camera System	1/97	$ 19,995.00
CPT-2013-A3P	PAL Pan/Tilt, 3-CCD, 13X Lens, Camera System	1/97	$ 20,995.00
	3-CCD, 13X LENS, PRESENTER CAMERA		
CPC-2013-A3N	NTSC Presenter, 3-CCD, 13X Lens, Camera System	1/97	$ 22,995.00
CPC-2013-A3N	Int'l, NTSC Presenter, 3-CCD, 13X Lens, Camera System	1/97	$ 23,995.00
CPC-2013-A3P	PAL Presenter, 3-CCD, 13X Lens, Camera System	1/97	$ 24,995.00
	3-CCD, 17X LENS, PAN/TILT CAMERA		
CPT-2017-A3N	NTSC Pan/Tilt, 3-CCD, 17X Lens, Camera System	1/97	$ 22,995.00
CPT-2017-A3N	Int'l, NTSC Pan/Tilt, 3-CCD, 17X Lens, Camera System	1/97	$ 23,995.00
CPT-2017-A3P	PAL Pan/Tilt, 3-CCD, 17X Lens, Camera System	1/97	$ 24,995.00
	3-CCD, 17X LENS, PRESENTER CAMERA		
CPC-2017-A3N	NTSC Presenter, 3-CCD, 17X Lens, Camera System	1/97	$ 26,995.00
CPC-2017-A3N	Int'l, NTSC Presenter, 3-CCD, 17X Lens, Camera System	1/97	$ 27,995.00
CPC-2017-A3P	PAL Presenter, 3-CCD, 17X Lens, Camera System	1/97	$ 28,995.00
	UPGRADE KITS		
CPC-2000-U	CPT to CPC, 1-CCD Upgrade Kit	1/97	$ 3,000.00
CPC-2000-U	Int'l, CPT to CPC, 1-CCD Upgrade Kit	1/97	$ 3,000.00
CPC-2300-U	CPT to CPC, 3-CCD Upgrade Kit	1/97	$ 4,000.00
CPC-2300-U	Int'l, CPT to CPC, 3-CCD Upgrade Kit	1/97	$ 4,000.00
	CAMERA JOYSTICK CONTROLLER - SHOT DIRECTOR		
JSC-2000	CameraMan ~~Joystick Controller~~ SHOT DIRECTOR	12/96	$ 2,995.00
JSC-2000	Int'l, CameraMan ~~Joystick Controller~~ SHOT DIRECTOR	12/96	$ 3,995.00
JSC-2100	CameraMan *auto*TRACK Joystick Controller	12/96	$ 3,995.00
JSC-2100	Int'l, CameraMan *auto*TRACK Joystick Controller	12/96	$ 4,995.00
SPS-2000	Shot Profile Software (Requires: Joystick and CCS software or Joystick and STUDIO system)	TBA	$ 995.00
SPS-2000	Int'l Shot Profile Software	TBA	$ 1,495.00

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MODEL #	DESCRIPTION	RELEASE DATE	LIST PRICE
	CAMERA CONTROL SOFTWARE		
CCS-2000	1-CCD Camera Control Software	TBA	$ 995.00
CCS-2000	Int'l, 1-CCD Camera Control Software	TBA	$ 1,495.00
CCS-2300	1-CCD/ 3-CCD Camera Control Software	TBA	$ 1,495.00
CCS-2300	Int'l, 1-CCD/ 3-CCD Camera Control Software	TBA	$ 1,995.00
	1-CCD STUDIO SYSTEM		
CSS-2000-G2N	NTSC, 1-CCD, CPT/CPT Studio System	TBA	$ 44,995.00
CSS-2000-G2N	Int'l, NTSC, 1-CCD, CPT/CPT Studio System	TBA	$ 46,995.00
CSS-2000-G2P	PAL, 1-CCD, CPT/CPT Studio System	TBA	$ 49,995.00
CSS-2000-PGN	NTSC, 1-CCD, CPC/CPT Studio System	TBA	$ 49,995.00
CSS-2000-PGN	Int'l, NTSC, 1-CCD, CPC/CPT Studio System	TBA	$ 51,995.00
CSS-2000-PGP	PAL, 1-CCD, CPC/CPT Studio System	TBA	$ 54,995.00
	3-CCD, 13X LENS STUDIO SYSTEM		
CSS-2313-G2N	NTSC, 3-CCD, 13X lens, CPT/CPT Studio System	TBA	$ 69,995.00
CSS-2313-G2N	Int'l, NTSC, 3-CCD, 13X lens, CPT/CPT Studio System	TBA	$ 71,995.00
CSS-2313-G2P	PAL, 3-CCD, 13X lens, CPT/CPT Studio System	TBA	$ 74,995.00
CSS-2313-PGN	NTSC, 3-CCD, 13X lens, CPC/CPT Studio System	TBA	$ 74,995.00
CSS-2313-PGN	Int'l, NTSC, 3-CCD, 13X lens, CPC/CPT Studio System	TBA	$ 76,995.00
CSS-2313-PGP	PAL, 3-CCD, 13X lens, CPC/CPT Studio System	TBA	$ 79,995.00
	3-CCD, 13X LENS STUDIO SYSTEM		
CSS-2317-G2N	NTSC, 3-CCD, 17X lens, CPT/CPT Studio System	TBA	$ 79,995.00
CSS-2317-G2N	Int'l, NTSC, 3-CCD, 17X lens, CPT/CPT Studio System	TBA	$ 81,995.00
CSS-2317-G2P	PAL, 3-CCD, 17X lens, CPT/CPT Studio System	TBA	$ 84,995.00
CSS-2317-PGN	NTSC, 3-CCD, 17X lens, CPC/CPT Studio System	TBA	$ 85,995.00
CSS-2317-PGN	Int'l, NTSC, 3-CCD, 17X lens, CPC/CPT Studio System	TBA	$ 87,995.00
CSS-2317-PGP	PAL, 3-CCD, 17X lens, CPC/CPT Studio System	TBA	$ 90,995.00
	ACCESSORIES		
CSS-2000-EPN	NTSC, Video/Audio Expansion Panel	TBA	$ 15,000.00
CSS-2000-EPN	Int'l, NTSC, Video/Audio Expansion Panel	TBA	$ 16,000.00
CSS-2000-EPP	PAL, Video/Audio Expansion Panel	TBA	$ 17,000.00
	COMPONENT ANALOG VIDEO CABLE		
CAV-2050	CameraMan Component Analog Video Cable 50'	TBA	$ TBA
CAV-2100	CameraMan Component Analog Video Cable 100'	TBA	$ TBA
CAV-2150	CameraMan Component Analog Video Cable 150'	TBA	$ TBA
CAV-2200	CameraMan Component Analog Video Cable 200'	TBA	$ TBA
CAV-2250	CameraMan Component Analog Video Cable 250'	TBA	$ TBA
	KEYPADS		
CCK-2015	1-CCD Camera Control Keypad (hardwire only)	Released	$ 495.00
CCK-2000	1-CCD Camera Control Keypad (hardwire only)	Released	$ 695.00
CCK-2315	3-CCD Camera Control Keypad (hardwire only)	Released	$ 495.00
CCK-2003	3-CCD Camera Control Keypad (hardwire only)	Released	$ 695.00
CKC-2025	CameraMan Keypad Cable (25')	Released	$ 10.00
CKC-2050	CameraMan Keypad Cable (50')	Released	$ 20.00
CKC-2100	CameraMan Keypad Cable (100')	Released	$ 40.00
CKC-2250	CameraMan Keypad Cable (250')	Released	$ 100.00

MODEL #	DESCRIPTION	RELEASE DATE	LIST PRICE
	***auto*TRACK COMPONENTS**		
TRP-2000	Tracking Ring Package	Released	$ 1295.00
ABP-2000	8-hour Auxiliary Battery Pack (for TRP-2000)	Released	$ 165.00
	CONVERTERS		
LCK-2000	1-CCD Lens Converter Kit	Released	$ 125.00
	MOUNTING HARDWARE		
CWM-2000	CameraMan Wall Mount	Released	$ 165.00
MSK-2000	Metal Stud Kit (for CWM-2000)	Released	$ 12.00
	POWER SUPPLIES		
CPS-2000	1-CCD CameraMan Power Supply (base unit)	Released	$ 40.00
CPS-2003	3-CCD CameraMan Power Supply (base unit)	Released	$ 120.00
	NETWORK CABLES		
CCC-2003	CameraMan Communication Cable (3') RS-485	Released	$ 6.00
CCC-2010	CameraMan Communication Cable (10') RS-485	Released	$ 8.00
CCC-2025	CameraMan Communication Cable (25') RS-485	Released	$ 12.00
CCC-2050	CameraMan Communication Cable (50') RS-485	Released	$ 18.00
CCC-2100	CameraMan Communication Cable (100') RS-485	Released	$ 28.00
CCC-2150	CameraMan Communication Cable (150') RS-485	Released	$ 38.00
CCC-2200	CameraMan Communication Cable (200') RS-485	Released	$ 48.00
CCC-2250	CameraMan Communication Cable (250') RS-485	Released	$ 58.00
	MAIN DOCKING STATION CABLE		
DSC-2003	Docking Station Cable (3')	Released	$ 69.00
DSC-2010	Docking Station Cable (10')	Released	$ 135.00

PC-Based Video Production Studio Specification

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2000-G2N **List Price: $44,995**
1-CCD CameraManSTUDIO System with (2) 8x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System (1-CCD)
  - 1/3" CCD (1)
  - 8x lens, f=5.9 to 47.2mm (0.65x and 1.5x adapters avail)
  - F.O.V.: 44.3° x 34.9° @ 5.9 mm
  - 5.8° x 4.4° @ 47.2 mm
  - 6 lux minimum illumination
  - Hor. Res.: 460 TV Lines
  - 99 location presets (±0.125° accuracy)
  - ≥46 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 14 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $2,995**
Joystick controller with 99 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $995**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
(904) 737-1367 (904) 733-3587 fax

PC-Based Video Production Studio with *auto*TRACK™ Camera

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2000-PGN **List Price: $49,995**
1-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 8x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System (1-CCD)
  - 1/3" CCD (1)
  - 8x lens, f=5.9 to 47.2mm (0.65x and 1.5x adapters avail)
  - F.O.V.: 44.3° x 34.9° @ 5.9 mm
  - 5.8° x 4.4° @ 47.2 mm
  - 6 lux minimum illumination
  - Hor. Res.: 460 TV Lines
  - 99 location presets (±0.125° accuracy)
  - ≥46 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 14 lbs
- (1) CameraMan Presenter Camera System (1-CCD)
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $3,995**
Joystick controller with 99 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $995**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
(904) 737-1367 (904) 733-3587 fax

PC-Based Video Production Studio Specification

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
To provide a Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one control platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2313-G2N **List Price: $69,995**
3-CCD CameraManSTUDIO System with (2) 13x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 13x lens, f=7.5 to 97.5mm
  - F.O.V.: 46.2°x 35.6° @ 7.5 mm, 3.8° x 2.8° @ 97.5 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 18 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $2,995**
Joystick controller with 125 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $995**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
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PC-Based Video Production Studio with *auto*TRACK™ Camera

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2313-PGN **List Price: $74,995**
3-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 13x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 13x lens, f=7.5 to 97.5mm
  - F.O.V.: 46.2° x 35.6° @ 7.5 mm
  - 3.8° x 2.8° @ 97.5 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 18 lbs

- (1) CameraMan Presenter Camera System
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $3,995**
Joystick controller with 125 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $995**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
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PC-Based Video Production Studio Specification

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
To provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2317-G2N **List Price: $79,995**
3-CCD CameraManSTUDIO System with (2) 17x lens cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Chroma-Luma Delay: < 15 nS
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 17x lens, f=7 to 119mm
  - F.O.V.: 49.1° x 37.8° @ 7 mm, 3.08° x 2.31° @ 119 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 19.5 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $2,995**
Joystick controller with 125 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $995**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
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PC-Based Video Production Studio with *auto*TRACK™ Camera

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2317-PGN **List Price: $85,995**
3-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 17x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: >58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 17x lens, f=7 to 119mm
  - F.O.V.: 49.1° x 37.8° @ 7 mm
  - 3.08° x 2.31° @ 119 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 19.5 lbs

- (1) CameraMan Presenter Camera System
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $3,995**
Joystick controller with 125 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $995**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

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PC-Based Production Studio *auto*TRACK™ Camera - International

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2000-PGN **List Price: $51,995**
1-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 8x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System (1-CCD)
  - 1/3" CCD (1)
  - 8x lens, f=5.9 to 47.2mm (0.65x and 1.5x adapters avail)
  - F.O.V.: 44.3° x 34.9° @ 5.9 mm
  - 5.8° x 4.4° @ 47.2 mm
  - 6 lux minimum illumination
  - Hor. Res.: 460 TV Lines
  - 99 location presets (±0.125° accuracy)
  - ≥46 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 14 lbs
- (1) CameraMan Presenter Camera System (1-CCD)
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $4,995**
Joystick controller with 99 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $1095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
(904) 737-1367 (904) 733-3587 fax

PC-Based Video Production Studio Specification - International

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2000-G2N **List Price: $46,995**
1-CCD CameraManSTUDIO System with (2) 8x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System (1-CCD)
  - 1/3" CCD (1)
  - 8x lens, f=5.9 to 47.2mm (0.65x and 1.5x adapters avail)
  - F.O.V.: 44.3° x 34.9° @ 5.9 mm
  - 5.8° x 4.4° @ 47.2 mm
  - 6 lux minimum illumination
  - Hor. Res.: 460 TV Lines
  - 99 location presets (±0.125° accuracy)
  - ≥46 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 14 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $3,995**
Joystick controller with 99 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
(904) 737-1367 (904) 733-3587 fax

PC-Based Video Production Studio Specification - International

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
To provide a Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one control platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2313-G2N **List Price: $71,995**
3-CCD CameraManSTUDIO System with (2) 13x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 13x lens, f=7.5 to 97.5mm
  - F.O.V.: 46.2°x 35.6° @ 7.5 mm, 3.8° x 2.8° @ 97.5 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 18 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $3,995**
Joystick controller with 125 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
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PC-Based Production Studio *auto*TRACK™ Camera - International

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2313-PGN **List Price: $76,995**
3-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 13x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 13x lens, f=7.5 to 97.5mm
  - F.O.V.: 46.2° x 35.6° @ 7.5 mm
  - 3.8° x 2.8° @ 97.5 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 18 lbs
- (1) CameraMan Presenter Camera System
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $4,995**
Joystick controller with 125 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
(904) 737-1367 (904) 733-3587 fax

PC-Based Video Production Studio Specification - International

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
To provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2317-G2N **List Price: $81,995**
3-CCD CameraManSTUDIO System with (2) 17x lens cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Chroma-Luma Delay: < 15 nS
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 17x lens, f=7 to 119mm
  - F.O.V.: 49.1° x 37.8° @ 7 mm, 3.08° x 2.31° @ 119 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 19.5 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $3,995**
Joystick controller with 125 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
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PC-Based Production Studio *auto*TRACK™ Camera - International

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2317-PGN **List Price: $87,995**
3-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 17x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: >58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 17x lens, f=7 to 119mm
  - F.O.V.: 49.1° x 37.8° @ 7 mm
  - 3.08° x 2.31° @ 119 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 19.5 lbs
- (1) CameraMan Presenter Camera System
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $4,995**
Joystick controller with 125 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
(904) 737-1367 (904) 733-3587 fax

PC-Based Video Production Studio Specification - PAL

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2000-G2P **List Price: $49,995**
1-CCD CameraManSTUDIO System with (2) 8x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.5 Mhz
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: PAL

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System (1-CCD)
  - 1/3" CCD (1)
  - 8x lens, f=5.9 to 47.2mm (0.65x and 1.5x adapters avail)
  - F.O.V.: 44.3° x 34.9° @ 5.9 mm
  - 5.8° x 4.4° @ 47.2 mm
  - 6 lux minimum illumination
  - Hor. Res.: 450 TV Lines
  - 99 location presets (±0.125° accuracy)
  - ≥46 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 14 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $3,995**
Joystick controller with 99 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
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PC-Based Production Studio *auto*TRACK™ Camera - PAL

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2000-PGP **List Price: $54,995**
1-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 8x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.5 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: PAL

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System (1-CCD)
  - 1/3" CCD (1)
  - 8x lens, f=5.9 to 47.2mm (0.65x and 1.5x adapters avail)
  - F.O.V.: 44.3° x 34.9° @ 5.9 mm
  - 5.8° x 4.4° @ 47.2 mm
  - 6 lux minimum illumination
  - Hor. Res.: 450 TV Lines
  - 99 location presets (±0.125° accuracy)
  - ≥46 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 14 lbs

- (1) CameraMan Presenter Camera System (1-CCD)
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $4,995**
Joystick controller with 99 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
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PC-Based Video Production Studio Specification - PAL

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
To provide a Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one control platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2313-G2P **List Price: $74,995**
3-CCD CameraManSTUDIO System with (2) 13x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.5 Mhz
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: PAL

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 13x lens, f=7.5 to 97.5mm
  - F.O.V.: 46.2°x 35.6° @ 7.5 mm, 3.8° x 2.8° @ 97.5 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 18 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $3,995**
Joystick controller with 125 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
8493 Baymeadows Way, Jacksonville, FL 32256
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PC-Based Production Studio *auto*TRACK™ Camera - PAL

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2313-PGP **List Price: $79,995**
3-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 13x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.5 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: PAL

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 13x lens, f=7.5 to 97.5mm
  - F.O.V.: 46.2° x 35.6° @ 7.5 mm
  - 3.8° x 2.8° @ 97.5 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 18 lbs
- (1) CameraMan Presenter Camera System
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $4,995**
Joystick controller with 125 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
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PC-Based Video Production Studio Specification - PAL

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, programming, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
To provide a PC-Based Video Production Studio capable of the following:

1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide over 2500 video special effects.
5. Provide the ability to have upgradeable software.
6. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2317-G2P **List Price: $84,995**
3-CCD CameraManSTUDIO System with (2) 17x lens cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Chroma-Luma Delay: < 15 nS
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: PAL

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (2) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 17x lens, f=7 to 119mm
  - F.O.V.: 49.1° x 37.8° @ 7 mm, 3.08° x 2.31° @ 119 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 19.5 lbs

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2000 Joystick Controller **List Price: $3,995**
Joystick controller with 125 location presets per camera, 16 camera selectable

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

PARKERVISION™
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(904) 737-1367 (904) 733-3587 fax

PC-Based Production Studio *auto*TRACK™ Camera - PAL

GENERAL
This specification is for a PC-Based Video Production Studio as identified for the customer. It is limited to the video production equipment and CameraMan pan/tilt camera systems. It does not account for installation and/or programming required for integration with other vendor equipment. Integration, installation, and training are the responsibility of the installing contractor. Only authorized ParkerVision CameraManSTUDIO™ resellers shall be selected for installation and training.

REQUIREMENTS
Provide a PC-Based Video Production Studio capable of the following:
1. Combine control of video sources, audio sources, video tape machines, and CameraMan pan/tilt camera systems into one platform, so that one person may control all these multiple functions simultaneously.
2. A general user interface which is Windows NT based and is divided into five sections: Video Control, Audio Control, VCR Control, Camera Control, and Transition Macro™ Control.
3. Ability to create and edit Transition Macros™ files, which include all information (video, audio, VCR, camera) needed to perform a transition with the press of a button.
4. Provide the ability to have a camera automatically follow a presenter with audio at the source.
5. Provide over 2500 video special effects.
6. Provide the ability to have upgradeable software.
7. Optional ability to record a camera movement, from a joystick, and recall that movement with the press of a button.

CameraManSTUDIO™ System
The CameraManSTUDIO™ combines the CameraMan™ System II™ Camera technology with studio automation control to provide a value-conscious solution with professional-quality performance. It allows all functions involved with video production (video, audio, VCR, and camera control) to be controlled by one person from one user interface. The system is PC-based providing an easy means of upgrading the system features.

CSS-2317-PGP **List Price: $90,995**
3-CCD *auto*TRACK™ CameraManSTUDIO System with (2) 17x lens Cameras

Studio PC:
- Intel Pentium @ 133 MHz
- Monitor: 17" SVGA, 1280x1024, .26 Dot Pitch
- 1.2 GB IDE Hard Drive, 6x CD-ROM
- 32MB Ram, upgradeable to 256 MB
- Windows NT workstation with CameraMan Studio Software

Video Features:
- Blackburst gen-lock input
- (2) infinite window TBC's with digital proc amp adjustments
- Digital video comb filter
- Independent preview and program output
- Linear key output
- Multi-layer real-time digital video mixer
- (1) alpha channel keyer, (2) luminance keyers and (2) wipe/tile generators - all with anti-aliased edges
- (2) chroma keyers with advanced chroma suppression and shadow preservation
- Six background generators for dynamic color ramps, static colors and noise
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Supports full and half-blending key modes
- Amplitude Deviation: ± 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: >58 dB
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.5 Mhz
- Chroma-Luma Delay: < 15 nS
- Digital Data: SMPTE 125M
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: PAL

Audio Features:
- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, ± 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB
- Equalizer: High, Mid, and Low frequency of each input

VCR Control:
- Remote control of (2) source VCR's and (1) record VCR
- (2) LTC and VITC reader/generators

Transition Macros:
- A sequence of operations, along with the associated delays and operation times, incorporating all controlled devices can be stored and assigned to a recall button.

Special Effects:
- Mosaic, flips, tumbles, Chroma/Luma Keyers
- Luminance Keyers with Adjustable Gain & Clip
- Over 100 wipe patterns with 25 different repeat factor variations, with offsets and anti-aliasing edges

Cameras (2):
- (1) CameraMan General Pan/Tilt Camera System
  - 1/2" IT (Interline Transfer Power HAD) CCD (3)
  - 17x lens, f=7 to 119mm
  - F.O.V.: 49.1° x 37.8° @ 7 mm
  - 3.08° x 2.31° @ 119 mm
  - 5 lux minimum illumination
  - Hor. Res.: 750 TV Lines
  - 125 location presets (±0.125° accuracy)
  - 60 dB S/N Ratio
  - ±25° Tilt / 359° Pan
  - Weight: 19.5 lbs
- (1) CameraMan Presenter Camera System
  Same as above with the following additional functionality:
  - Wireless tracking and audio to 60ft. from the camera

Cables (2):
- (2) 50' CameraMan Communication Cables

Options:
JSC-2100 Joystick Controller w/*auto*TRACK **List Price: $4,995**
Joystick controller with 125 location presets per camera, 16 camera selectable, and *auto*TRACK controls

SPS-2000 Shot Profiler™ Software **List Price: $1,095**
Records real-time data from the Joystick controller. This data can then be edited and/or played back at a later time for use with repetitive camera movements. Shot Profiler™ recorded data can also be stored within Transition Macros™ for pre-production programming.

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CameraManSTUDIO™ Expansion Panel

PRELIMINARY SPEC SHEET **Model# CSS-2000-EP**

Description:

The expansion panel is required when the number of input source devices in a system exceed the input capacity of the CameraManSTUDIO™ . This expansion panel will increase the input and output capabilities of the CameraManSTUDIO™ system.

Video Features:

- (2) infinite window TBC's with digital proc amp adjustments (gain, set-up, hue, and saturation)
- Digital video comb filter
- Independent preview and program output
- Software selection among (6) composite, (4) Y/C, or (4) analog component input signals
- Frequency Response (Input to Output):
  - Y : -0.25 dB Max @ 0-4.5 MHz
  - R-Y/B-Y: -0.5 dB Max @ 0-2.0 Mhz
- Amplitude Deviation: $\pm$ 2 IRE Max
- Diff. Phase: < 1.5°
- Diff. Gain: < 4.0%
- S/N Ratio: > 58 dB
- Chroma-Luma Delay: < 15 nS
- Analog Y/R-Y/B-Y: Betacam
- Analog Composite and Y/C: RS-170A

Audio Features:

- Sampling Rates: 44.1 & 48 KHz
- Resolution: 16 bits
- Analog Inputs: 8 Balanced, +4dB / -10dB
- Analog Outputs: 8 Balanced, +4dB / -10dB
- Frequency Response: 20 Hz - 20 KHz, $\pm$ 0.5 dB
- Dynamic Range: 92 dB typical
- THD: 1 KHz: 0.003% typical
- Crosstalk: 1 KHz: -95 dB

Equalizer: High, Mid, and Low frequency of each input

LIST PRICE $15,000

Product Pricing

▼ CameraManSTUDIO™ System Pricing

Preliminary

CameraManSTUDIO™ System Pricing

	Model No.	Component	List Price	Reseller Cost
single-CCD Standard System	**CSS-2000-G2N**	**single-CCD Standard System**	**$44,995.00**	**33,746.00**
	CSS-2000-G2N			
	CPT-2000-A1N	2 General Pan/Tilt Camera Systems (single-CCD) PROCESSOR/CONTROLLER		
	SPC-2000-N	~~Studio PC with 17" Monitor and~~ CameraManSTUDIO ~~SW System~~ w/17" COLOR MONITOR		
	CCC-2050	2 Camera Communication Cables		
single-CCD autoTRACK™ System	**CSS-2000-PGN**	**single-CCD *auto*TRACK™ System**	**$49,995.00**	**37,496.00**
	CSS-2000-PGN			
	CPT-2000-A1N	1 General Pan/Tilt Camera Systems (single-CCD)		
	CPC-2000-A1N	1 Presenter Camera System (single-CCD)		
	SPC-2000-N	~~Studio PC with~~ 17" Monitor ~~and~~ CameraManSTUDIO ~~SW~~		
	CCC-2050	2 Camera Communication Cables		
three-CCD Standard System	**CSS-2313-G2N**	**three-CCD Standard System**	**$69,995.00**	**52,496.00**
	CSS-2313-G2N			
	CPT-2013-A3N	2 General Pan/Tilt Camera Systems (three-CCD 13x Lens)		
	SPC-2000-N	~~Studio PC~~ with 17" Monitor ~~and~~ CameraManSTUDIO ~~SW~~		
	CCC-2050	2 Camera Communication Cables		
three-CCD autoTRACK™ System	**CSS-2313-PGN**	**three-CCD *auto*TRACK™ System**	**$74,995.00**	**56,246.00**
	CSS-2313-PGN			
	CPT-2013-A3N	1 General Pan/Tilt Camera Systems (three-CCD 13x Lens)		
	CPC-2013-A3N	1 Presenter Camera System (three-CCD 13x Lens)		
	SPC-2000-N	~~Studio PC~~ with 17" ~~Monitor and~~ CameraManSTUDIO ~~SW~~		
	CCC-2050	2 Camera Communication Cables		
three-CCD Standard System	**CSS-2317-G2N**	**three-CCD Standard System**	**$79,995.00**	**59,996.00**
	CSS-2317-G2N			
	CPT-2017-A3N	2 General Pan/Tilt Camera Systems (three-CCD 17x Lens)		
	SPC-2000-N	~~Studio PC~~ with 17" Monitor ~~and~~ CameraManSTUDIO ~~SW~~		
	CCC-2050	2 Camera Communication Cables		
three-CCD autoTRACK™ System	**CSS-2317-PGN**	**three-CCD *auto*TRACK™ System**	**$85,995.00**	**64,496.00**
	CSS-2317-PGN			
	CPT-2017-A3N	1 General Pan/Tilt Camera Systems (three-CCD 17x Lens)		
	CPC-2017-A3N	1 Presenter Camera System (three-CCD 17x Lens)		
	SPC-2000-N	~~Studio PC~~ with 17" Monitor ~~and~~ CameraManSTUDIO ~~SW~~		
	CCC-2050	2 Camera Communication Cables		

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▼ CameraManSTUDIO™ System Pricing

Preliminary

CameraManSTUDIO™ System Pricing

Model No.	Component	List Price	Reseller Cost
CameraManSTUDIO™ Hardware Options			
CSS-2000-EPN	Video/Audio Expansion ~~Panel~~ Rack	$15,000.00	11,250.00
CCK-2315	Hard-wired Camera Control Keypad	$495.00	371.00
CCK-2003	Digital RF-900™ Keypad	$695.00	521.00
CMM-2000	CameraMan Monitor Mount	$95.00	71.00
CWM-2000	CameraMan Wall Mount	$165.00	124.00
JSC-2000	~~Joystick Controller~~ SP	$2,995.00	2,246.00
JSC-2100	SP Joystick Controller with *auto*TRACK™	$3,995.00	2,996.00
CameraManSTUDIO™ Software Options			
SPS-2000	Shot Profiler Software (to work w/ SP ~~Joystick~~)	$995.00	746.00
Keypad Cables			
CKC-2025	25' CameraMan Keypad Cable	$10.00	8.00
CKC-2050	50' CameraMan Keypad Cable	$20.00	15.00
CKC-2100	100' CameraMan Keypad Cable	$40.00	30.00
CKC-2250	250' CameraMan Keypad Cable	$100.00	75.00
Joystick & Network Cables			
CCC-2010	10' CameraMan Communication Cable	$8.00	6.00
CCC-2025	25' CameraMan Communication Cable	$12.00	9.00
CCC-2050	50' CameraMan Communication Cable	$18.00	14.00
CCC-2100	100' CameraMan Communication Cable	$28.00	21.00
Additional Cameras			
CPT-2000-A1N	General Pan/Tilt Camera System (single-CCD)	$4,995.00	3,496.00
CPC-2000-A1N	Presenter Camera System (single-CCD)	$7,995.00	5,996.00
CPT-2013-A3N	General Pan/Tilt Camera System (three-CCD 13x Lens)	$18,995.00	13,296.00
CPC-2013-A3N	Presenter Camera System (three-CCD 13x Lens)	$22,995.00	16,096.00
CPT-2017-A3N	General Pan/Tilt Camera System (three-CCD 17x Lens)	$22,995.00	16,096.00
CPC-2017-A3N	Presenter Camera System (three-CCD 17x Lens)	$26,995.00	18,896.00

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▼ CameraManSTUDIO™ System International Pricing

Preliminary

SAME AS NTSC

CameraManSTUDIO™ System International Pricing-NTSC

	Model No.	Component	List Price	Reseller Cost
single-CCD Standard System	**CSS-2000-G2N**	**single-CCD Standard System (NTSC)**	**$46,995.00**	**35,246.00**
	CPT-2000-A1N	2 General Pan/Tilt Camera Systems (single-CCD)		
	SPC-2000-N	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
single-CCD autoTRACK™ System	**CSS-2000-PGN**	**single-CCD *auto*TRACK™ System (NTSC)**	**$51,995.00**	**38,996.00**
	CPT-2000-A1N	1 General Pan/Tilt Camera Systems (single-CCD)		
	CPC-2000-A1N	1 Presenter Camera System (single-CCD)		
	SPC-2000-N	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD Standard System	**CSS-2313-G2N**	**three-CCD Standard System (NTSC)**	**$71,995.00**	**53,996.00**
	CPT-2013-A3N	2 General Pan/Tilt Camera Systems (three-CCD 13x Lens)		
	SPC-2000-N	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD autoTRACK™ System	**CSS-2313-PGN**	**three-CCD *auto*TRACK™ System (NTSC)**	**$76,995.00**	**57,746.00**
	CPT-2013-A3N	1 General Pan/Tilt Camera Systems (three-CCD 13x Lens)		
	CPC-2013-A3N	1 Presenter Camera System (three-CCD 13x Lens)		
	SPC-2000-N	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD Standard System	**CSS-2317-G2N**	**three-CCD Standard System (NTSC)**	**$81,995.00**	**61,496.00**
	CPT-2017-A3N	2 General Pan/Tilt Camera Systems (three-CCD 17x Lens)		
	SPC-2000-N	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD autoTRACK™ System	**CSS-2317-PGN**	**three-CCD *auto*TRACK™ System (NTSC)**	**$87,995.00**	**65,996.00**
	CPT-2017-A3N	1 General Pan/Tilt Camera Systems (three-CCD 17x Lens)		
	CPC-2017-A3N	1 Presenter Camera System (three-CCD 17x Lens)		
	SPC-2000-N	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		

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▼ CameraManSTUDIO™ System International Pricing

Preliminary

CameraManSTUDIO™ System International Pricing-PAL

	Model No.	Component	List Price	Reseller Cost
single-CCD Standard System	**CSS-2000-G2P**	**single-CCD Standard System (PAL)**	**$49.995.00**	**37,446.00**
	CPT-2000-A1P	2 General Pan/Tilt Camera Systems (single-CCD)		
	SPC-2000-P	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
single-CCD autoTRACK™ System	**CSS-2000-PGP**	**single-CCD *auto*TRACK™ System (PAL)**	**$54,995.00**	**41,246.00**
	CPT-2000-A1P	1 General Pan/Tilt Camera Systems (single-CCD)		
	CPC-2000-A1P	1 Presenter Camera System (single-CCD)		
	SPC-2000-P	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD Standard System	**CSS-2313-G2P**	**three-CCD Standard System (PAL)**	**$74,995.00**	**56,246.00**
	CPT-2013-A3P	2 General Pan/Tilt Camera Systems (three-CCD 13x Lens)		
	SPC-2000-P	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD autoTRACK™ System	**CSS-2313-PGP**	**three-CCD *auto*TRACK™ System (PAL)**	**$79,995.00**	**59,996.00**
	CPT-2013-A3P	1 General Pan/Tilt Camera Systems (three-CCD 13x Lens)		
	CPC-2013-A3P	1 Presenter Camera System (three-CCD 13x Lens)		
	SPC-2000-P	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD Standard System	**CSS-2317-G2P**	**three-CCD Standard System (PAL)**	**$84,995.00**	**63,746.00**
	CPT-2017-A3P	2 General Pan/Tilt Camera Systems (three-CCD 17x Lens)		
	SPC-2000-P	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		
three-CCD autoTRACK™ System	**CSS-2317-PGP**	**three-CCD *auto*TRACK™ System (PAL)**	**$90,995.00**	**68,246.00**
	CPT-2017-A3P	1 General Pan/Tilt Camera Systems (three-CCD 17x Lens)		
	CPC-2017-A3P	1 Presenter Camera System (three-CCD 17x Lens)		
	SPC-2000-P	Studio PC with 17" Monitor and CameraManSTUDIO SW		
	CCC-2050	2 Camera Communication Cables		

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CameraManSTUDIO™ System International Pricing

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CameraManSTUDIO™ System International Pricing

Model No.	Component	List Price	Reseller Cost
CameraManSTUDIO™ Hardware Options			
CSS-2000-EPN	Audio/Video Expansion ~~Panel~~-NTSC	$16,000.00	12,000.00
CSS-2000-EPP	Audio/Video Expansion ~~Panel~~-PAL	$17,000.00	12,750.00
CCK-2315	Hard-wired Camera Control Keypad	$595.00	446.00
CCK-2003	Digital RF-900™ Keypad	$795.00	596.00
CMM-2000	CameraMan Monitor Mount	$195.00	146.00
CWM-2000	CameraMan Wall Mount	$265.00	199.00
JSC-2000	~~Joystick Controller~~	$3,995.00	2,796.00
JSC-2100	~~Joystick Controller~~ with *auto*TRACK™	$4,995.00	3,496.00
CameraManSTUDIO™ Software Options			
SPS-2000	Shot Profiler Software (to work w/ ~~Joystick~~)	$1,995.00	1,496.00
Keypad Cables			
CKC-2025	25' CameraMan Keypad Cable	$20.00	15.00
CKC-2050	50' CameraMan Keypad Cable	$40.00	30.00
CKC-2100	100' CameraMan Keypad Cable	$80.00	60.00
CKC-2250	250' CameraMan Keypad Cable	$200.00	150.00
~~Joystick~~ & Network Cables			
CCC-2010	10' CameraMan Communication Cable	$16.00	12.00
CCC-2025	25' CameraMan Communication Cable	$24.00	18.00
CCC-2050	50' CameraMan Communication Cable	$36.00	27.00
CCC-2100	100' CameraMan Communication Cable	$56.00	42.00
Additional Cameras			
CPT-2000-A1N	General Pan/Tilt Camera System (single-CCD) NTSC	$5,995.00	4,196.00
CPT-2000-A1P	General Pan/Tilt Camera System (single-CCD) PAL	$6,995.00	4,896.00
CPC-2000-A1N	Presenter Camera System (single-CCD) NTSC	$8,995.00	6,296.00
CPC-2000-A1P	Presenter Camera System (single-CCD) PAL	$9,995.00	6,996.00
CPT-2013-A3N	General Pan/Tilt Camera System (three-CCD 13x Lens) NTSC	$19,995.00	13,996.00
CPT-2013-A3P	General Pan/Tilt Camera System (three-CCD 13x Lens) PAL	$20,995.00	14,696.00
CPC-2013-A3N	Presenter Camera System (three-CCD 13x Lens) NTSC	$23,995.00	16,796.00
CPC-2013-A3P	Presenter Camera System (three-CCD 13x Lens) PAL	$24,995.00	17,496.00
CPT-2017-A3N	General Pan/Tilt Camera System (three-CCD 17x Lens) NTSC	$23,995.00	16,796.00
CPT-2017-A3P	General Pan/Tilt Camera System (three-CCD 17x Lens) PAL	$24,995.00	17,496.00
CPC-2017-A3N	Presenter Camera System (three-CCD 17x Lens) NTSC	$27,995.00	19,596.00
CPC-2017-A3P	Presenter Camera System (three-CCD 17x Lens) PAL	$28,995.00	20,296.00

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Training

Training is a vital part of the marketing plan for the CameraManSTUDIO. To provide hands on training capability at ParkerVision an actual working studio will be constructed. This studio will also be used to produce promotional videos. The training program will have several phases beginning with RSM/RSC training, then reseller training, then customer training both in-house and on-site. Following is a description of each type of training and the associated cost.

RSM/RSC TRAINING CLASS

RSM/RSC training will take place in Jacksonville, Florida at the corporate headquarters. This class will be four days long and include system overview, system specifications, system operation with hands-on training, application/ market selling, sales lead overview, service and support overview, system warranty procedures. The tentative date for this training is the week of January 6, 1997.

RESELLER TRAINING CLASS

Reseller training will take place in Jacksonville, Florida at the corporate headquarters. This class will be two days long and include a system overview, system specifications, system operation, application/ market selling, sales lead overview, service and support overview, system warranty procedures.
ParkerVision will invite two people from each authorized reseller to attend this training class. Airfare, lodging, and meals will be provided for each attendee. International participants must provide their on airfare. Additional people from an authorized reseller may attend this training at their own expense.
The tentative scheduled for this class will be three different sessions during January 13- 27, 1997.

CUSTOMER IN-HOUSE TRAINING CLASS

Customer in-house training will take place in Jacksonville, Florida at the corporate headquarters. This class will be three days long and include a general system overview, technical system overview, system operation with hands-on training, service and support overview, system warranty.
ParkerVision will provide this training for $695.00 list per person which includes all course materials, lunch each day and dinner one night. Transportation and lodging costs are the responsibility of each attendee. This course will be scheduled as needed on a monthly basis with a minimum of five participants required. The dealer cost for this training class is $486.50 per person. This fee can be waived at the discretion of the RSM if a large sales potential exists.

CUSTOMER ON-SITE TRAINING CLASS

On-site customer training will take place at designated locations that are equipped with a CameraManSTUDIO. This class will be three days long and include a general system overview, technical system overview, system operation with hands-on training, service and support overview, system warranty.
ParkerVision will provide this training for $2495.00 per class which includes all course materials. Transportation, meals, and lodging costs are the responsibility of each attendee. This course will be scheduled as needed.

Warranty

PARKERVISION ONE-YEAR LIMITED WARRANTY

- ParkerVision warrants to the end user that this product will be free from defects in material and/or workmanship for a one-year period commencing the date of delivery, except where expressly noted.
- **Proof of Purchase:** The ParkerVision's authorized Dealer's dated bill of sale must be retained as evidence of the date of purchase and to establish warranty eligibility.
- ParkerVision will correct all defects in material or workmanship, or any failure of the system to perform to specifications during the warranty period, at no charge for parts and labor.
- The original purchaser must notify ParkerVision, in writing, **before the warranty period has expired** in the event of a defect in material or workmanship, or failure of the system to perform to specifications.
- If damage occurs in the shipment from the ParkerVision factory, ParkerVision must be notified within five working days of receipt of product in order to make a claim.
- ParkerVision is not obligated at any time to provide the purchaser with a substitute unit.
- The warranty is not extended due to purchasing new products and/or upgrading your original product.
- The warranty is non-transferable.
- Purchaser's failure to make a claim as provided above or continued use of the product shall constitute an unqualified acceptance of such product and a waiver by purchaser of all claims.

Product Warranty Registration Form

- The warranty period begins the day your ParkerVision product is received.
- Product Warranty Registration is required to ensure your product receives prompt attention if warranty work is ever necessary.

Please see your product warranty registration form, which is packaged with every product, for details on enrolling.

THE WARRANTY IS VOIDED IF:

- The product is damaged in shipping other than the original shipment from the ParkerVision factory.
- The product is used outside of the specifications or operating guidelines, as outlined in the ParkerVision product manuals.
- The product has sustained physical damage from misuse or abuse.
- The product has sustained damage due to a natural disaster such as fire, lightning, earthquake, etc.
- The product is damaged by non-ParkerVision peripherals.
- A person not authorized by ParkerVision attempted/or has serviced the equipment.
- The product's identification (serial numbers, trademarks, etc.) is removed, defaced, or altered.

Return Policies

For return procedures call ParkerVision's customer service line at (800) 532-8034, or (904) 737-1367.

No extended warranty is available at this time.

Video Terms and Definitions

AC Coupled

AC coupling is a method of inputting a video signal to a circuit to remove any DC offset, or the overall voltage level that the video signal "rides" on. One way to find the signal is to remove the DC offset by AC coupling, and then do DC restoration to add a known DC offset (one that we selected). Another reason AC coupling is important is that it can remove harmful DC offsets.

Active Video

The part of the video waveform that is not specified to be blanking, burst, or sync information. Most of the active video, if not all of it, is visible on the display screen.

ADC, A/D

Analog-to-Digital Converter. This device is used to get video and audio into a computer. An ADC for digitizing video must be capable of sampling at 10 to 150 million samples per second (MSPS). There are two main types of ADCs: flash and sigma delta.

AFC

Automatic frequency control. Commonly used to lock onto and track a desired frequency.

AGC

Automatic gain control. Used to keep the output signal of a circuit constant as the input signal amplitude varies.

Alpha

See Alpha Channel and Alpha Mix.

Alpha Channel

The alpha channel is used to specify an alpha value for each color pixel. The alpha value is used to control the blending, on a pixel-by-pixel basis, of two images.

new pixel = (alpha)(pixel A color) + (1 - alpha)(pixel B color)

Alpha typically has a normalized value of 0 to 1. In a computer environment, the alpha values can be stored in additional bit planes of frame-buffer memory. When you hear about 32-bit frame buffers, what this really means is that there are 24 bits of color, 8 each for red, green, and blue, along with an 8-bit alpha channel. Also see Alpha Mix.

Alpha Mix

This is a way of combining two images. How the mixing is performed is provided by the alpha channel. The little box that appears over the left-hand shoulder of a news anchor is put there by an alpha mixer. Wherever the pixels of the little box appear in the frame buffer, an alpha number of "1" is put in the alpha channel. Wherever they don't appear, an alpha number of "0" is placed. When the alpha mixer sees a "1" coming from the alpha channel, it displays the little box. Whenever it sees a "0", it displays the news anchor. Of course, it doesn't matter if a "1" or a "0" is used, but you get the point.

AM

Short for amplitude modulation.

Amplitude Modulation

A method of encoding data onto a carrier, such that the amplitude of the carrier is proportionate to the data.

Anti-Alias Filter

A filter (typically a lowpass filter) used to bandwidth-limit the signal before sampling to less than half the sampling rate.

Aperture Delay

Aperture delay is the time from an edge of the input clock of the ADC until the time the part actually takes the sample. The smaller this number, the better.

Aperture Jitter

The uncertainty in the aperture delay. This means the aperture delay time changes a little bit over time, and that little bit of change is the aperture jitter.

Artifacts

In the video domain, artifacts are blemishes, noise, snow, spots, whatever. When you have an image artifact, something is wrong with the picture from a visual standpoint. Don't confuse this term with not having the display properly adjusted. For example, if the hue control is set wrong, the picture will look bad, but this is not an artifact. An artifact is some physical disruption of the image.

Aspect Ratio

The ratio of the width of the picture to the height. For most current TVs, this ratio is 4:3. For HDTV, the ratio will be 16:9. The aspect ratio, along with the number of vertical scan lines that make up the image, determines what sample rate should be used to digitize the video signal.

Asynchronous

Refers to circuitry without a common clock or timing signal.

Audio Modulation

Refers to modifying a carrier with audio information so that it may be mixed with the video information and transmitted.

Audio Subcarrier

A specific frequency that is modulated with audio data before being mixed with the video data and transmitted.

Authoring Platform

A computer that has been outfitted with the right hardware for creating material to be viewed in a multimedia box. The video quality of the authoring platform has to be high enough that the playback equipment is the limiting factor.

Automatic Frequency Control

See AFC.

Automatic Gain Control

See AGC.

Back Porch

The area of the video waveform between the trailing edge of the horizontal sync and right before the active video.

Bandpass Filter

A circuit that allows only a selected range of frequencies to pass through.

Bandwidth

The range of frequencies a circuit will respond to or pass through. It may also be the difference between the highest and lowest frequencies of a signal.

Baseband

When applied to audio and video, baseband means an audio or video signal that has not been RF modulated (to channel 3 or 4 for example).

BBC

British Broadcasting Corporation.

BITC

This stands for Burned-In Time Code. This means the timecode information is displayed within a portion of the picture, and may viewed on any monitor or TV.

Black Burst

Black burst is a composite video signal with a totally black picture. Black burst is used to sync video equipment together so that video output is aligned. Black burst tells the video equipment the vertical sync, horizontal sync, and the chroma burst information.

Black Level

This level represents the darkest an image can get. This defines what black is for the particular image system. If for some reason the video dips below this level, it is referred to as blacker-than-black. You could say that sync is blacker-than-black.

Blanking

On the screen, the scan line moves from the left edge to the right edge, jumps back to the left edge, and starts out all over again, on down the screen. When the scan line hits the right-hand limit and is about to be brought back to the left-hand edge, the video signal is blanked so that you can't "see" the return path of the scan beam from the right to the left-hand edge. To blank the video signal, the video level is brought down to the blanking level, which may or may not be the black level if a pedestal is used.

Blanking Level

That level of the video waveform defined by the system to be where blanking occurs. This could be the black level if a pedestal is not used or below the black level if a pedestal is used.

Blooming

This is an effect, sometimes caused when video becomes whiter-than-white, in which a line that is supposed to be nice and thin becomes fat and fuzzy on the screen.

Breezeway

That portion of the video waveform between the rising edge of the horizontal sync and the start of color burst.

Brightness

This is the intensity of the video level and refers to how much light is emitted by the display.

Burst

See color burst.

Burst Gate

This is a signal that tells the system where the color burst is located within the scan line.

B'-Y'

In color television, the blue-minus-luma signal, also called a color difference signal. When added to the luma (Y') signal, it produces the blue primary signal.

Carrier

A signal which is modulated with data to be transmitted.

CATV

Community antenna television, now generally meaning cable TV.

CBC

Canadian Broadcasting Corporation.

CCIR

Comite Consultatif International des Radiocommunications or International Radio Consultative Committee. The CCIR no longer exists-it has been absorbed into the parent body, the ITU.

CCIR 601

Now known as Recommendation ITU-R BT.601, this is a recommendation developed by the International Radio Consultative Committee for the digitization of color video signals. ITU-R BT.601 deals with color space conversion from R'G'B' to Y'CbCr, the digital filters used for limiting the bandwidth, the sample rate (defined as 13.5 MHz), and the horizontal resolution (720 active pixels).

Checksum

An error-detecting scheme which is the sum of the data values transmitted. The receiver computes the sum of the received data values and compares it to the transmitted sum. If they are equal, the transmission was error-free.

Chroma

The (M) NTSC or (B, D, G, H, I) PAL video signal contains two pieces that make up what you see on the screen: the black and white (luma) part, and the color part. Chroma is the color part. In an (M) NTSC or (B, D, G, H, I) PAL video signal, the luma (black and white) and the chroma (color) information are combined together. If you want to decode an NTSC or PAL video signal, the luma and chroma must be separated. The chroma bandpass filter removes the luma from the video signal, leaving the chroma relatively intact. This works reasonably well except in certain images where the luma information and chroma information overlap, meaning that we have luma and chroma stuff at the same frequency. The filter can't tell the difference between the two and passes everything within a certain area. If there is luma in that area, it's let through too. This can make for a funny-looking picture. Next time you're watching TV and someone is wearing a herringbone jacket or a shirt with thin, closely spaced stripes, take a good look. You'll see a rainbow color effect moving through that area. What's happening is that the chroma demodulator thinks the luma is chroma. Since the luma isn't chroma, the TV can't figure out what color it is and it shows up as a rainbow pattern. This problem can be overcome by using a comb filter.

Chroma Burst

See Color Burst.

Chroma Demodulator

After the (M) NTSC or (B, D, G, H, I) PAL video signal makes its way through the Y/C separator, by either the chroma bandpass, chroma trap, or comb filter method, the colors must be decoded. That's what a chroma demodulator does. It takes the chroma output of the Y/C separator and recovers two color difference signals (typically I and Q or U and V). To do this, the chroma demodulator uses the color subcarrier. Now, with the luma information and color difference signals, the video system can figure out what colors to put on the screen.

Chroma Key

This is a method of combining two video images. An example of chroma keying in action is the nightly news weatherman standing in front of a giant weather map. In actuality, the weatherman is standing in front of a solid, bright-blue background and his (or her) image is projected on top of the computer-generated map. This is how it works: a TV camera is pointed at the person or object that you want to project on top of the artificial background (e.g., the weather map). The background doesn't actually have to be artificial. It can be another real imageÑit doesnÕt really matter. As mentioned, our imaginary weatherman is standing in front of a bright-blue background. This person and bright-blue background image is fed along with the image of the artificial background into a box. Inside the box, a decision is made. Wherever it sees the bright-blue background, it displays the artificial background. Wherever it does not see bright blue, it shows the original image. So, whenever the weatherman moves around, he's moving around in front of the bright-blue background. The box figures out where he is and where he isn't, and displays the appropriate image.

Chroma Trap

In an (M) NTSC or (B, D, G, H, I) PAL video signal, the luma (black and white) and the chroma (color) information are combined together. If you want to decode the video signal, the luma and chroma must be separated. The chroma trap is a method for separating the chroma from the luma, leaving the luma relatively intact. How does this work? The NTSC or PAL signal is fed to a bandstop filter. For all practical purposes, a bandstop filter allows some types of information (actually certain frequencies) to pass through but not others. The bandstop filter is designed with a response, or stop, to remove the chroma so that the output of the filter only contains the luma. Another name for a bandstop filter is a trap. Since this trap stops chroma, it's called a chroma trap. The sad part about all of this is that not only does the filter remove chroma, it removes luma as well if it exists within the region where the stop exists. The filter only knows ranges and, depending on the image, the luma information may overlap the chroma information. The filter can't tell the difference between the luma and chroma, so it stops both when they are in the same range. What's the big deal? Well, you lose luma and this means that the picture is degraded somewhat. Using a comb filter for a Y/C separator is better than a chroma trap or chroma bandpass. See the chroma bandpass and the Y/C separator definitions.

Chrominance

In video, the terms chrominance and chroma are commonly (and incorrectly) interchanged. See the definition of chroma.

CIF

Common Interface Format. This video format was developed to easily allow video phone calls between countries. The CIF format has a resolution of 352 x 288 active pixels and a refresh rate of 29.97 frames per second.

Clamp

This is basically another name for the DC-restoration circuit. It can also refer to a switch used within the DC-restoration circuit. When it means DC restoration, then
it's usually used as "clamping". When it's the switch, then it's just "clamp".

Clipping Logic

A circuit used to prevent illegal conversion. Some colors can exist in one color space but not in another. Right after the conversion from one color space to another,
a color space converter might check for illegal colors. If any appear, the clipping logic is used to chop off, or clip, part of the information until a legal color can be
represented. Since this circuit clips off some information and is built using logic, it's not too hard to see how the name "clipping logic" was developed.

Closed Captioning

A service which decodes text information transmitted with the audio and video signal and displays it at the bottom of the display. See the EIA-608 specification for (M) NTSC usage of closed captioning.

CMYK

This is a color space primarily used in color printing. CMYK is an acronym for Cyan, Magenta, Yellow, and blacK. The CMYK color space is subtractive, meaning that cyan, magenta, yellow and black pigments or inks are applied to a white surface to remove color information from the white surface to create the final color. The reason black is used is because even if a printer could put down hues of cyan, magenta, and yellow inks perfectly enough to make black (which it can't for large areas), it would be too expensive since colored inks cost more than black inks. So, when black has to be made, instead of putting down a lot of CMY, they just use black. So, what is a printing term doing here? The reason is that a lot of color systems are being hooked up to color printers. The display screen uses RGB but the printer uses CMYK. A color space conversion needs to be performed for true WYSIWYG ("wizzy-wig"--What You See Is What You Get) performance in a color system that has a printer.

Color Bars

This is a test pattern used to check whether a video system is calibrated correctly. A video system is calibrated correctly if the colors are the correct brightness, hue, and saturation. This can be checked with a vectorscope, or by looking at the RGB levels.

Color Burst

That portion of the video waveform that sits between the breezeway and the start of active video. The color burst tells the color decoder how to decode the color information contained in that line of active video. By looking at the color burst, the decoder can determine what's blue, orange, or magenta. Essentially, the decoder figures out what the correct color is. If you've ever seen a TV picture in which the colors were just not right, a reason might be that the TV can't find the color burst and doesn't know how to make the correct color.

Color Decoder

This is the circuit in the video system that uses the chroma portion of a video signal to derive the two color difference signals. The color decoder sits right after the Y/C separator and before the color space converter. The color decoder needs a reference signal that is accurately phase-locked to the color burst. If it isn't locked well enough, then the color decoder can't figure out the right colors. Also called a Chroma Demodulator.

Color Demodulator

See Color Decoder and Chroma Demodulator.

Color Difference

All of the color spaces used in color video require three components. These might be R'G'B', Y'IQ, Y'UV or Y'(R' - Y')(B' - Y'). In the Y'(R' - Y')(B' - Y') color space, the R' - Y' and B' - Y' components are often referred to as color difference signals for obvious reasons. They are made by subtracting the luma (Y') from the red and blue components. I and Q and U and V are also color difference signals since they are scaled versions of R' - Y' and B' - Y'. All the Ys in each of the Y'IQ, Y'UV and Y'(R' - Y')(B' - Y') are basically the same.

Color Edging

Extraneous colors that appear along the edges of color pictures, but don't have a color relationship to those areas.

Color Encoder

The color encoder does the exact opposite of the color decoder. It takes the two color difference signals, such as I and Q or U and V, and combines them into the chroma signal. The color encoder, or what may be referred to as the color modulator, uses the color subcarrier to do the encoding.

Color Key

This is essentially the same thing as Chroma Key.

Color Killer

A color killer is a circuit that shuts off the color decoder in a video system if the incoming video does not contain color information. How does this work? The color killer looks for the color burst and if it can't find it, it shuts off the color decoder. For example, let's say that a color TV is going to receive material recorded in black and white. Since the black and white signal does not contain a color burst, the color decoder is shut off. Why is a color killer used? Well, in the old days, the color decoder would still generate a tiny little bit of color if a black and white transmission was received, due to small errors in the color decoder, causing a black and white program to have faint color spots throughout the picture.

Color Modulator

See Color Encoder.

Color Purity

This term is used to describe how close a color is to the theoretical. For example, in the Y'UV color space, color purity is specified as a percentage of saturation and +/-q, where q is an angle in degrees, and both quantities are referenced to the color of interest. The smaller the numbers, the closer the actual color is to the color that it's really supposed to be. For a studio-grade device, the saturation is +/-2% and the hue is +/-2 degrees. On a vectorscope, if you're in that range, you're studio grade.

Color Space

A color space is a mathematical representation for a color. No matter what color space is used-RGB, Y'IQ, Y'UV, etc.-orange is still orange. What changes is how you represent orange in a video system. For example, the RGB color space is based on a Cartesian coordinate system and the HSI color space is based on a polar coordinate system.

Color Subcarrier

The color subcarrier is a clock signal used to run the color encoder or color decoder. For (M) NTSC the frequency of the color subcarrier is about 3.58 MHz and for (B, D, G, H, I) PAL it's about 4.43 MHz. In the color encoder, a portion of the color subcarrier is used to create the color burst, while in the color decoder, the color burst is used to reconstruct the color subcarrier.

Color Temperature

Color temperature is measured in degrees Kelvin. If a TV has a color temperature of 8,000 degrees Kelvin, that means the whites have the same shade as a piece of pure carbon heated to that temperature. Low color temperatures have a shift towards red; high color temperature have a shift towards blue.

The standard for (M) NTSC in the United States is 6,500 degrees Kelvin. Thus, professional TV monitors use a 6,500-degree color temperature. However, most consumer TVs have a color temperature of 9,000 degrees Kelvin or higher, resulting in a bluish cast. By adjusting the color temperature of the TV, more accurate colors are produced, at the expense of picture brightness.

Comb Filter

This is another method of performing Y/C separation. A comb filter is used in place of a chroma bandpass or chroma trap. The comb filter provides better video quality since it does a better job of separating the luma from chroma. It reduces the amount of creepy-crawlies or zipper artifacts. It's called a comb filter because the frequency response looks like a comb. The important thing to remember is that the comb filter is a better method for Y/C separation than chroma bandpass or chroma trap.

Compact Disk Interactive

Instead of a PC with special hardware, CD-I is a dedicated box that you buy just like any other piece of consumer audio or video gear.

Comparator

This is a circuit or functional block that is a basic component of flash ADCs. A comparator has two inputs, X and Y, along with one output, which we will call Z. The comparator implements the following mathematical function:

If A - B > 0, then Z = 1
If A - B < 0, then Z = 0

What does this mean? A comparator "compares" A to B. If A is larger than B, the output of the comparator is a "1". If A is smaller than B, then the output is a "0". If A = B, the output Z may be undefined and oscillate between "1" and "0" wildly until that condition is removed, it may be a "1", or it may be a "0". It depends on how the comparator was designed.

Composite TV Signal

The combination of color video and timing signals.

Composite Video

A single signal that contains color video and timing information. If a video system is to receive video correctly, it must have several pieces of the puzzle in place. It must have the picture that is to be displayed on the screen, and it must be displayed with the correct colors. This piece is called the active video. The video system also needs information that tells it where to put each pixel. This is called sync. The display needs to know when to shut off the electron beam so the viewer can't see the spot retrace across the display. This piece of the video puzzle is called blanking. Now, each piece could be sent in parallel over three separate connections, and it would still be called video and would still look good on the screen. This is a waste, though, because all three pieces can be combined together so that only one connection is needed. Composite video is a video stream that combines all of the pieces required for displaying an image into one signal, thus requiring only one connection. (M) NTSC and (B, D, G, H, I) PAL are examples of composite video. Both are made up of: active video, horizontal sync, horizontal blanking, vertical sync, vertical blanking, and color burst. RGB is not an example of composite video, even though each red, green, and blue signals may each contain sync and blank information, because all three signals are required to display the picture with the right colors.

Compression Ratio

Compression ratio is a number used to tell how much information is squeezed out of an image when it has been compressed. For example, suppose we start with a 1 MB image and compress it down to 128 KB. The compression ratio would be:

1,048,576 / 131,072 = 8

This represents a compression ratio of 8:1; 1/8 of the original amount of storage is now required. For a given compression technique-MPEG, for example-the higher the compression ratio, the worse the image looks. This has nothing to do with which compression method is better, for example JPEG vs. MPEG. Rather, it depends on the application. A video stream that is compressed using MPEG at 100:1 may look better than the same video stream compressed to 100:1 using JPEG.

Contouring

This is an image artifact caused by not having enough bits to represent the image. The reason the effect is called "contouring" is because the image develops lines that look like a geographical contour map. In a black-and-white imaging system, contouring may be noticed at 6 bits per pixel or less, while in a color system it may be 18 bits per pixel or less.

Contrast

A video term referring to how far the whitest whites are from the blackest blacks in a video waveform. If the peak white is far away from the peak black, the image is said to have high contrast. With high contrast, the image is very stark and very "contrasty", like a black-and-white tile floor. If the two are very close to each other, the image is said to have poor, or low, contrast. With poor contrast, an image may be referred to as being "washed out"-you can't tell the difference between white and black, and the image looks gray.

Creepy Crawlies

Yes, this is a real video term! Creepy-crawlies refers to a specific image artifact that is a result of the (M) NTSC system. When the nightly news is on, and a little box containing a picture appears over the anchorperson's shoulder, or when some computer-generated text shows up on top of the video clip being shown, get up close to the TV and check it out. Along the edges of the box, or along the edges of the text, you'll notice some jaggies "rolling" up (could be down) the picture. That's the creepy-crawlies. Some people refer to this as zipper because it looks like one.

Cross Color

This occurs when the NTSC/PAL decoder incorrectly interprets high-frequency luma information (brightness) to be chroma information (color), resulting in color being displayed where it shouldn't.

Cross Luma

This occurs when the NTSC/PAL decoder incorrectly interprets chroma information (color) to be high-frequency luma information (brightness).

Cross Modulation

A condition when one signal erroneously modulates another signal.

Crosstalk

Interference from one signal that is detected on another.

D-1, D-5

These are noncompressed component video tape formats (19 mm tape for D-1 and 0.5" tape for D-5) for very high-end digital video tape decks.

D-2, D-3

These are noncompressed composite video tape formats (19 mm tape for D-2 and 0.5" tape for D-3) for medium- to high-end digital video tape decks.

DAC, D/A

These are short for digital-to-analog converter.

dB

Abbreviation for decibels, a standard unit for expressing relative power, voltage, or current.

$dB = 10 \log10 (P1/P2)$

dBm

Measure of power in communications. 0 dBm = 1 mW, with a logarithmic relationship as the values increase or decrease. In a 50-ohm system, 0 dBm = 0.223
volts.

dBw

Decibels referenced to 1 watt.

DC Restoration

DC restoration is what you have to do to a video waveform after it has been AC coupled and has to be digitized. Since the video waveform has been AC coupled, we no longer know absolutely where it is. For example, is the bottom of the sync tip at -5v or at 100v? Is the back porch at 3.56v or at 0v? In fact, not only don't we know where it is, it also changes over time, since the voltage level of the active video changes over time. Since the resistor ladder on the flash ADC is tied to a pair of voltage references, such as REF- to 0 volts and REF+ to 1.3 volts, the video waveform needs to be referenced to some known DC level; otherwise, we couldn't digitize it correctly. DC restoration is essentially putting back a DC component that was removed to make an AC-coupled signal. We don't have to put back the original DC value-it could be a different one. In digitizing video, the DC level for DC restoration is such that the sync tip is set to the ADCs REF- level. Therefore, when sync tip is digitized it will be assigned the number 0 and when peak white is digitized, it will be assigned the number 196. (This assumes that the gains are correct, but that's another problem.)

DCT

This is short for Discrete Cosine Transform, used in the JPEG, MPEG, H.261, and H.263 compression algorithms.

Decibel

One-tenth of a Bel, used to define the ratio of two powers, voltages, or currents, in terms of gains or losses. It is 10x the log of the power ratio and 20x the voltage or current ratio.

Decimation

When a video waveform is digitized so that 100 pixels are produced, but only every other one is stored or used, the video waveform is decimated by a factor of 2:1. The image is now 1/4 of its original size, since 3/4 of the data is missing. If only one out of five pixels were used, then the image would be decimated by a factor of 5:1, and the image would be 1/25 its original size. Decimation, then, is a quick-and-easy method for image scaling and is in fact the method used by low-cost systems that scale video into a window. Decimation can be performed in several ways. One way is the method just described, where data is literally thrown away. Even though this technique is easy to implement and cheap to build, it generally introduces image artifacts unacceptable to medium- to high-end customers. Another method is to use a decimation filter. This reduces the image artifacts to an acceptable level by smoothing them out, but is more costly to implement than the method of just throwing data away.

Decimation Filter

See "decimation" above. A decimation filter is a filter designed to provide decimation without the artifacts associated with throwing data away (the method of throwing data away is the example described in the decimation definition).

Deemphasis

Also referred to as post-emphasis and post-equalization. Deemphasis performs a frequency-response characteristic that is complementary to that introduced by pre-emphasis.

Deemphasis Network

A circuit used to restore the pre-emphasized frequency response to its original form.

Demodulation

The process of recovering an original signal from a modulated carrier.

Demodulator

In video, demodulation is the technique used to recover the color difference signals in (M) NTSC or (B, D, G, H, I) PAL systems. See the definitions for Chroma Demodulator and Color Decoder; those are two other names for a demodulator used in a video application.

Differential Gain

Differential gain is how much the color saturation changes when the luma level changes (it isn't supposed to). The result on the screen will be incorrect color saturation. For a video system, the better the differential gain-that is, the smaller the number specified-the better the system is at figuring out the correct color.

Differential Phase

Differential phase is how much the hue changes when the luma level changes (it isn't supposed to). The result on the screen will be incorrect colors. For a video system, the better the differential phase-that is, the smaller the number specified-the better the system is at figuring out the correct color.

Digital Component Video

Digital video using separate color components, such as Y'CbCr or R'G'B'. See CCIR 601. Sometimes incorrectly referred to as D-1.

Digital Composite Video

Digital video that is essentially the digitized waveform of (M) NTSC or (B, D, G, H, I) PAL video signals, with specific digital values assigned to the sync, blank, and white levels. Sometimes incorrectly referred to as D-2 or D-3.

Digital Versatile Disk

See DVD.

Digital Video Interactive, DVI

DVI is a multimedia system being marketed by Intel. It is not just an image-compression scheme, but includes everything that is necessary to implement a multimedia playback station. Intel's DVI offering is represented by chips, boards, and software.

Direct Broadcast Satellite, DBS

A service that transmits multiple channels of television programming from a satellite to direct to the home.

Discrete Cosine Transform, DCT

A DCT is just another way to represent an image. Instead of looking at it in the time domain-which, by the way, is how we normally do it-it is viewed in the frequency domain. It's analogous to color spaces, where the color is still the color but is represented differently. Same thing applies here-the image is still the image, but it is represented in a different way.

Why do JPEG, MPEG, H.261, and H.263 base part of their compression schemes on the DCT? Because it is more efficient to represent an image that way. In the same way that the Y'CbCr color space is more efficient than RGB in representing an image, the DCT is more efficient at image representation.

Discrete Time Oscillator

A discrete time oscillator is a digital version of the voltage-controlled oscillator.

Dot Pitch

The distance between screen pixels measured in millimeters. The shorter the distance, the better the resolution. It is specified in pixels/mm.

Drop Field Scrambling

This method is identical to the sync suppression technique, except there is no suppression of the horizontal blanking intervals. Sync pulse suppression only takes place during the vertical blanking interval. The descrambling pulses still go out for the horizontal blanking intervals (to fool unauthorized descrambling devices). If a descrambling device is triggering on descrambling pulses only, and does not know that the scrambler is using the drop field scrambling technique, it will try to reinsert the horizontal intervals (which were never suppressed). This is known as double reinsertion, which causes compression of the active video signal. An unauthorized descrambling device creates a washed-out picture and loss of neutral sync during drop field scrambling.

Double Buffering

As the name implies, you need two buffers-for video, this means two frame buffers. While one of the buffers is being displayed, the other buffer is operated on by a filter, for example. When the filter is finished, the buffer that was just operated on is displayed while the first buffer is now operated on. This goes back and forth, back and forth. Since the buffer that contains the correct image (already operated on) is always displayed, the viewer does not see the operation being performed and just sees a perfect image all the time.

Downconverter

A circuit used to lower one or more high-frequency signals to a lower, intermediate range.

Downlink

The frequency carrier satellites use to transmit data to Earth stations.

DVD

Compact discs that hold over two hours of digital audio (5.1 channels) and video, data, and graphics. The video is compressed and stored using MPEG 2.

Dynamic Range

The weakest to the strongest signals a circuit will accept as input or generate as an output.

EIA

Electronics Industries Association.

Equalization Pulses

These are two groups of pulses, one that occurs before the serrated vertical sync and another group that occurs after. These pulses happen at twice the normal horizontal scan rate. They exist to ensure correct 2:1 interlacing in early televisions.

Fade

Fading is a method of switching from one video source to another. Next time you watch a TV program (or a movie), pay extra attention when the scene is about to end and go on to another. The scene fades to black, then a fade from black to another scene occurs. Fading between scenes without going to black is called a dissolve. One way to do a fade is to use an alpha mixer.

Field

An interlaced TV screen is made using two fields, each one containing half of the scan lines needed to make up one frame of video. Each field is displayed in its entirety-therefore, the odd field is displayed, then the even, then the odd, and so on. Fields only exist for interlaced scanning systems. So for (M) NTSC, which has 525 lines per frame, a field has 262.5 lines, and two fields make up a 525-line frame.

Filter

In general, a filter is a used to remove unwanted material from a signal. If you have some high frequencies, such as noise, in with the signal that you really want, then a lowpass filter is used. A lowpass filter "passes" frequencies below a certain point and stops frequencies above that same point. A highpass filter does just the opposite-it stops low frequencies and passes the high frequencies. A bandpass filter lets through frequencies within a certain range or "band", but stops frequencies outside of the band.

Finite Impulse Response (FIR) Filter

This definition won't teach you how to design one of these, but will at least get you the basic information. A FIR filter is a type of digital filter. FIRs can be any type, such as lowpass, highpass or bandpass. Digital filters in general are much better than analog filters. Sometimes the only way to design a very high-quality filter is with an FIR-it would be impossible to design using analog components. A FIR filter is very, very good, it's digital, and it's somewhat expensive to build.

Flash A/D

A really fast method for digitizing something. The signal to be digitized is provided as the source for one input of a whole bank of comparators. The other input is tied to a tap of a resistor ladder, with each comparator tied to its own tap. This way, when the input voltage is somewhere between the top and bottom voltages connected to the ladder, the comparators output a thermometer code. This means that all the comparators output a "yes" up to the input voltage and a "no" above that. The ADC then takes this string of Yes's and No's and converts them into a binary number which tells where the Yes's turned into No's. See the definition of resistor ladder for more details, if you're interested.

Flicker

Flicker occurs when the refresh rate of the video is too low. It's the same effect produced by an old fluorescent light fixture. In order for flicker to disappear, the update rate, or the video frame rate, must be at least 24 scene changes (frames) per second. This is fast enough so that the eyeball can't keep up with the individual frames. The two problems with flicker are that it's distracting and tiring to the eyes.

FM

Abbreviation for frequency modulation. This technique sends data as patterns of frequency variations of a carrier signal.

Frame

A frame of video is essentially one picture or "still" out of a video stream. In (M) NTSC, a frame of video is made up of 525 individual scan lines. For (B, D, G, H, I) PAL, it's 625 scan lines. If you get up close to your TV screen, you'll be able to see the individual lines that make up the picture. For (M) NTSC, after 525 lines are painted on the screen, the next frame appears; then after that one, the next; and so on, and so on. By playing these individual frames fast enough, it looks like people are "moving" on the screen. It's the same principle as flip cards, cartoons, and movies.

Frame Buffer

A frame buffer is a big bunch of memory, used to hold the image for the display. How much memory are we talking about? Well, let's assume a horizontal resolution of 640 pixels and 480 scan lines, and we'll use the RGB color space. This works out to be:

640 x 480 x 3 = 921,600 bytes or 900 KB

So, 900 KB are needed to store one frame of video at that resolution.

Frame Rate

The frame rate of a video source is how fast the source repaints the screen with a new frame. For example, with the (M) NTSC system, the screen is repainted about once every 30th of a second for a frame rate of about 30 frames per second. For (B,D,G,H,I) PAL, the frame rate is 25 frames per second. For computer displays, the frame rate is now usually 72-75 frames per second.

Frame Rate Conversion

Frame rate conversion is the act of converting one frame rate to another. One real example that poses a difficult problem is that the frame rate of (M) NTSC, about 30 frames per second, is different from a typical computer's display, which may be anywhere from 72 to 75 frames per second (or Hz if you prefer). Therefore, some frame-rate conversion process must be performed before (M) NTSC video can be shown correctly on a computer display. Without frame rate conversion, the screen might look as if it "stalls" every now and then. If there is motion within the video, the objects that are moving might appear cut in half.

Frequency Modulation

See FM.

Front Porch

This is the area of the video waveform that sits between the start of horizontal blank and the leading edge (start of) horizontal sync.

Gamma

The characteristics of the displays using phosphors (as well as some cameras) are nonlinear. A small change in voltage when the voltage level is low produces a change in the output display brightness level, but this same small change in voltage at a high voltage level will not produce the same magnitude of change in the brightness output. This effect, or actually the difference between what you should have and what you actually measured, is known as gamma.

Gamma Correction

Computers like to number crunch on linear RGB data. Before being displayed, this linear RGB data must be processed (gamma corrected) to compensate for the gamma of the display.

GCR

Ghost cancellation reference signal. A reference signal on (M) NTSC scan lines 19 and 282 and (B, D, G, H, I) PAL scan line 318 that allows the removal of ghosting from TVs. Filtering is employed to process the transmitted GCR signal and determine how to filter the entire video signal to remove the ghosting. ITU-R BT.1124 defines the standard each country uses.

Genlock

A video signal provides all of the information necessary for a decoder to reconstruct the picture. This includes brightness, color, and timing information. To properly decode the video signal, the decoder must be "genlocked" to the video signal. The decoder looks at the color burst of the video signal and reconstructs the original color subcarrier that was used by the encoder. This is needed to properly decode the color information. The decoder also generates a pixel clock (done by looking at the sync information within the video signal) that was the same as the pixel clock used by the encoder. The pixel clock is used to clock pixel data out of the decoder into a memory for display or into another circuit for processing. The circuitry within the decoder that does all of this work is called the genlock circuit. Although it sounds simple, the genlock circuit must be able to handle very bad video sources, such as the output of VCRs. In reality, the genlock circuit is the most complex section of a video decoder.

Gray Scale

The term gray scale has several meanings. It some instances it means the luma component of color video signals. In other cases, it means a black-and-white video signal.

H.320, H.261

ITU-T H.320 is a family of standards developed for video teleconferencing systems using ISDN. It references H.261 (for video); G.711, G.722, and G.728 (for audio); H.221, H.230, H.231, H.233, H.234, H.242, and H.243 (for control). The standard allows a system from one manufacturer to "talk" to a system from another manufacturer, just as two different FAX machines can "talk" to each other.

H.324, H.263

ITU-T H.324 is a family of standards developed for multimedia communication systems using conventional phone lines. It references H.261 and H.263 (for video); G.723 (for audio); H.223 and H.245 (for control).

Hi-8

Hi-8 is a videotape format that uses an 8-mm wide tape. It provides better image quality than VHS.

High Definition Television, HDTV

This term describes several advanced standards proposals to allow high-resolution TV to be received in the home.

Highpass Filter

A circuit that passes, without attenuation, frequencies above a specific frequency (the cutoff frequency). Frequencies below the cutoff frequency are reduced in amplitude to eliminate them.

Horizontal Blanking

During the horizontal blanking interval, the video signal is at the blank level so as not to display the electron beam when it sweeps back from the right to the left side of the screen.

Horizontal Scan Rate

This is how fast the scanning beam in a display or a camera is swept from side to side. In the (M) NTSC system this rate is 63.556 ms, or 15.734 kHz. That means the scanning beam in your home TV moves from side to side 15,734 times a second.

Horizontal Sync

This is the portion of the video signal that tells the display where to place the image in the left-to-right dimension. The horizontal sync pulse tells the receiving system where the beginning of the new scan line is. Check to see if your TV at home has a horizontal hold control. If it does, give it a twist and observe what happens. When the picture rolls around like that, it's demonstrating what the picture would look like if there weren't any horizontal sync, or if the receiver couldn't find it.

HSI

HSI stands for Hue, Saturation and Intensity. It is a color space used to represent images. HSI is based on polar coordinates, while the RGB color space is based on a three-dimensional Cartesian coordinate system. The intensity, analogous to luma, is the vertical axis of the polar system. The hue is the angle and the saturation is the distance out from the axis. HSI is more intuitive to manipulate colors as opposed to the RGB space. For example, in the HSI space, if you want to change red to pink, you decrease the saturation. In the RGB space, what would you do? My point exactly. In the HSI space, if you wanted to change the color from purple to green, you would adjust the hue. Take a guess what you would have to do in the RGB space. However, the key thing to remember, as with all color spaces, is that it's just a way to represent a color-nothing more, nothing less.

HSL

This is similar to HSI, except that HSL stands for Hue, Saturation and Lightness.

HSV

This is similar to HSI, except that HSV stands for Hue, Saturation and Value.

HSYNC

Check out the Horizontal Sync definition.

Hue

In technical terms, hue refers to the wavelength of the color. That means that hue is the term used for the base color-red, green, yellow, etc. Hue is completely separate from the intensity or the saturation of the color. For example, a red hue could look brown at low saturation, bright red at a higher level of saturation, or pink at a high brightness level. All three "colors" have the same hue.

Huffman Coding

Huffman coding is a method of data compression. It doesn't matter what the data is-it could be image data, audio data, or whatever. It just so happens that Huffman coding is one of the techniques used in JPEG, MPEG, H.261, and H.263 to help with the compression. This is how it works. First, take a look at the data that needs to be compressed and create a table that lists how many times each piece of unique data occurs. Now assign a very small code word to the piece of data that occurs most frequently. The next largest code word is assigned to the piece of data that occurs next most frequently. This continues until all of the unique pieces of data are assigned unique code words of varying lengths. The idea is that data that occurs most frequently is assigned a small code word, and data that rarely occurs is assigned a long code word, resulting in space savings.

Illegal Video

Some colors that exist in the RGB color space can't be represented in the video domain. For example, 100% saturated red in the RGB space (which is the red color on full strength and the blue and green colors turned off) can't exist in the (M) NTSC video signal, due to color bandwidth limitations. The (M) NTSC encoder must be able to determine that an illegal color is being generated and stop that from occurring, since it may cause over-saturation and blooming.

Image Buffer

For all practical purposes, an image buffer is the same as a frame buffer. An image is acquired by the computer and stored in the image buffer. Once it is in the image buffer, it can typically be annotated with text or graphics or manipulated in some way, just like anything else in a frame buffer.

Image Compression

Image compression is used to reduce the amount of memory required to store an image. For example, an image that has a resolution of 640 x 480 and is in the RGB color space at 8 bits per color, requiring 900 KB of storage. If this image can be compressed at a compression ratio of 20:1, then the amount of storage required is only 45 KB. There are several methods of image compression, but the most popular are JPEG and MPEG. H.261 and H.263 are the video compression standards used for video conferencing.

Improved Definition Television, IDTV

IDTV (also called enhanced definition television or EDTV) is different from HDTV. IDTV is a system that improves the display on TVs by adding processing in the TV; standard (M) NTSC or (B, D, G, H, I) PAL signals are transmitted.

Input Level

For flash ADCs, the input level is the voltage range required of the input video for proper operation of the part. For example, if the required input level for an 8-bit ADC is 0v to 10v, then an input voltage level of 0v is assigned the code 0 and an input voltage of 10v is assigned the code 255. It is important that the voltage range of the input signal matches that of the ADC. Let's take a case where the voltage range of the signal is 0v to 5v and the ADC's input range is 0v to 10v. When the input level is 0v, the output of the ADC will be the number 0, and when the input signal is at its maximum of 5v, the output of the ADC will be 127. In this example, one-half of the ADC is wasted because the numbers 128 through 255 can't be generated since the input level of the source never gets high enough. The problem exists in the other direction also. Let's take an example where the input voltage level has the range of 0v to 10v, but the input range of the ADC is only 0v to 5v. When the input level is 0v, the output of the ADC will be the number 0, but when the input signal is in the range of 5v to 10v, the output of the ADC will be stuck at 255, since the input is outside of the range for the ADC.

Intensity

This is the same thing as brightness.

Interlaced

An interlaced raster system is one where two interleaved fields are used to scan out one video frame. Therefore, the number of lines in a field is one-half of the number of lines in a frame. In (M) NTSC, there are 262.5 lines per field (525 lines per frame) while there are 312.5 lines per field in (B, D, G, H, I) PAL. Each field is drawn on the screen consecutively-first one field, then the other. Why did the founding fathers (oops, persons) of video decide to go with an interlaced system? It has to do with frame rate. A large TV screen that was updated at 30 frames per second would flicker, meaning that the image would begin to fade away before the next one was drawn on the screen. By using two fields, each containing one-half of the information that makes up the frame and each field being drawn on the screen consecutively, the field update rate is 60 fields per second. At this update rate, the eye blends everything together into a smooth, continuous motion.

Interpolation

Interpolation is a mathematical way of regenerating missing or needed information. Let's say that an image needs to be scaled up by a factor of two, from 100 pixels to 200 pixels. We can do this by interpolation. The missing pixels are generated by interpolating between the two pixels that are on either side of the pixel that needs to be generated. After all of the "missing" pixels have been interpolated-presto!-200 pixels exist where only 100 existed before, and the image is twice as big as it used to be. There are many methods of interpolation; the method described here is an example of simple averaging.

IRE Unit

An arbitrary unit used to describe the amplitude characteristics of a video signal. Pure white is defined to be 100 IRE and the blanking level is defined to be 0 IRE.

JBIG

JBIG (Joint Bi-level Image Experts Group) losslessly compresses binary (one bit per pixel) images. The intent of JBIG is to replace the current group 3 and 4 fax algorithms. JBIG can be used on grey-scale or color images by applying the algorithm one bit-plane at a time.

Jitter

Short-term variations in the characteristics (such as frequency, amplitude, etc.) of a signal.

JPEG

JPEG stands for Joint Photographic Experts Group. However, what people usually mean when they use the term "JPEG" is the image compression standard developed by an international body. JPEG was developed to compress still images, such as photographs, a single video frame, something scanned into the computer, and so forth. You can run JPEG at any speed that the application requires. For a still picture database such as mugshots, the algorithm doesn't have to be too fast. If you run JPEG fast enough, though, you can compress motion video-which means that JPEG would have to run at 30 frames per second. You might want to do this if you were designing a video editing or authoring platform. Now, JPEG running at 30 frames per second is not as efficient as MPEG running at 30 frames per second because MPEG was designed to take advantage of certain aspects of motion video. So in a video editing platform, you would have to trade off the lower bit rate (high compression) of MPEG with the ability to do frame-by-frame edits in JPEG (but not in MPEG). Both standards have their place in a video compression strategy and both standards will probably exist in a system simultaneously.

Line Store

A line store is a memory buffer used to hold one line of video. If the horizontal resolution of the screen is 640 pixels and RGB is used as the color space, the line store would have to be 640 locations long by 3 bytes wide. This amounts to one location for each pixel and each color plane. Line stores are typically used in filtering algorithms. For example, a comb filter is made up of one or more line stores. The DCT used in the JPEG, MPEG, H.261, and H.263 compression algorithms could use eight line stores since processing is done on blocks of 8 x 8 pixels.

Linearity

Linearity is a basic measurement of how well an ADC or DAC is performing. Linearity is typically measured by making the ADC or DAC represent a diagonal line. The actual output of the device is compared to what is the ideal the output. The difference between the actual diagonal line and the ideal line is a measure of the linearity. The smaller the number, the better. Linearity is typically specified as a range or percentage of LSBs (Least Significant Bits).

Locked

When a PLL is accurately producing horizontal syncs that are precisely lined up with the horizontal syncs of the incoming video source, the PLL is said to be "locked". When a PLL is locked, the PLL is stable and there is minimum jitter in the generated pixel clock.

Longitudinal Timecode

See LTC.

Loop Filter

A loop filter is used in a PLL design to smooth out tiny bumps in the output of the phase comparator that might drive the loop out of lock. The loop filter helps to determine how well the loop locks, how long it takes to lock and how easy it is to knock the loop out of lock.

Lossless

Lossless is a term used with image compression. Lossless image compression is when the decompressed image is exactly the same as the original image. It's lossless because you haven't lost anything.

Lossy

Lossy image compression is the exact opposite of lossless. The regenerated image is different from the original image. The differences may or may not be noticeable, but if the two images are not identical, the compression was lossy.

Lowpass Filter

A circuit that passes, without attenuation, frequencies below a specific frequency (the cutoff frequency). Frequencies above the cutoff frequency are reduced in amplitude to eliminate them.

LTC

Longitudinal Timecode. Timecode information is stored on audio tracks, requiring an entire field's time to store or read the timecode information.

Luma

As mentioned in the definition of chroma, the (M) NTSC and (B, D, G, H, I) PAL video systems use a signal that has two pieces: the black and white part, and the color part. The black and white part is the luma. It was the luma component that allowed color TV broadcasts to be received by black and white TVs and still remain viewable.

Luminance

In video, the terms luminance and luma are commonly (and incorrectly) interchanged. See the definition of luma.

Media Engine

This is the host processor or a DSP processor that coordinates all of the video and audio activities in a multimedia platform. The media engine is used to coordinate the audio with the video, control multiple video inputs, and control the compression and decompression hardware.

MESECAM

Middle East SECAM or (B, G, D, K) SECAM. The French use (L) SECAM.

MHEG

MHEG is an acronym for Multimedia Hypermedia Expert Group. MHEG standardizes a multimedia information interchange format called "Coded Representation of Multimedia and Hypermedia Information Objects" (ISO/IEC 13522).

MJPEG

MJPEG is an acronym for Motion JPEG. JPEG compression or decompression is applied real-time to video at up to 25 or 30 frames per second. Each field of video is individually processed.

(M) NTSC

To make it simple, (M) NTSC is the color video standard used in North America and some other parts of world to get video into your home and to record onto video tape. One of the requirements for the color television broadcast standard that the NTSC (National Television Standards Committee) created in the 1950s was that it had to be capable of being received on a black-and-white set. When it came down to selecting what color space to use for this new color TV standard, RGB couldn't be used since all three colors, or planes, are independent. This means that each plane-red, green, or blue-has the same chance, or probability, of representing the picture as any other, so all three are needed. How could a black-and-white set, that receives only one plane, receive three? The answer was, it couldn't.
The NTSC decided to make a new color space based on a black and white component and two color difference signals. Since, in the RGB space, each color has as good a chance of representing the image as any other color (equal bandwidth), the black-and-white component is made up of portions of all three colors. This black and white component is often referred to as the luma. The two color difference signals were developed by taking the red signal and subtracting out the luma, and taking the blue signal and also subtracting out the luma. Thus, the color space for (M) NTSC is a luma component (Y') with red minus luminance (R'-Y') and blue minus luminance (B'-Y'). After a little bit of mathematics, the R'-Y' component turns into an I component while the B'-Y' component turns into a Q component. I and Q are modulated and added together to create the chroma, which contains all of the color information for the picture. The color information is then added to the black-and-white information. Therefore, the (M) NTSC system is just like a black-and-white sketch with a water color wash painted over it for color.
The (M) NTSC system uses 525 lines per frame, a 29.97 frame per second update rate, and the Y'IQ color space. Modern (M) NTSC encoders and decoders may also use the Y'UV color space instead.

Modulator

A modulator is basically a circuit that combines two different signals in such a way that they can be pulled apart later. What does this have to do with video? Let's take the (M) NTSC system as an example, although the example applies equally as well to (B, D, G, H, I) PAL. The (M) NTSC system uses the Y'IQ or Y'UV color space, with the I and Q or U and V signals containing all of the color information for the picture. Two 3.58-MHz color subcarriers (90 degrees out of phase) are modulated by the I and Q or U and V components and added together to create the chroma part of the (M) NTSC video.

Moire

This is a type of image artifact. A moire effect occurs when a pattern is created on the screen where there really shouldn't be one. A moire pattern is typically generated when two different frequencies beat together to create a new, unwanted frequency.

Monochrome

A monochrome signal is a video source having only one component. Although usually meant to be the luma (or black-and-white) video signal, the red video signal coming into the back of a computer display is monochrome because it only has one component.

Monotonic

This is a term that is used to describe ADCs and DACs. An ADC or DAC is said to be monotonic if for every increase in input signal, the output increases also. The output should not decrease. Any ADC or DAC that is nonmonotonic-meaning that the output does decrease for an increase in input-is bad! Nobody wants a nonmonotonic ADC or DAC.

Motion Estimation

Motion estimation is trying to figure out where an object has moved to from one video frame to the other. Why would you want to do that? Well, let's take an example of a video source showing a ball flying through the air. The background is a solid color that is different from the color of the ball. In one video frame the ball is at one location and in the next video frame the ball has moved up and to the right by some amount. Now let's assume that the video camera has just sent the first video frame of the series. Now, instead of sending the second frame, wouldn't it be more efficient to send only the position of the ball? Nothing else moves, so only two little numbers would have to be sent instead of 900 KB (the amount of storage required for a whole frame of video). This is the essence of motion estimation. By the way, motion estimation is an integral part of MPEG, H.261, and H.263.

Motion JPEG

See MJPEG.

MPEG

MPEG stands for Moving Picture Experts Group. This is an ISO/IEC (International Standards Organization) body that is developing compression algorithms for motion video. MPEG differs from JPEG in that MPEG takes advantage of the redundancy on a frame-to-frame basis of a motion video sequence, where JPEG does not.

MPEG 2

MPEG 2 extends the MPEG 1 standard to cover a wider range of applications.

MPEG 3

MPEG 3 was originally targeted for HDTV applications. This has now been incorporated into MPEG 2.

MPEG 4

The goal is to establish a universal, efficient coding of diffrent forms of audio-visual data, called audio-visual objects. A set of coding tools for audio-visual objects will be developed to support various functionalities, such as object-based interactivity and scalability. A syntactic description of audio-visual objects will also be developed, allowing a way of describing the coded representation of the objects and how they were coded. This information can be conveyed to a decoder, enabling new algorithms to be downloaded for execution. It is expected in late 1998.

Multimedia

Multimedia describes a system that uses combinations of text, graphics, still pictures, video, and audio in an interactive way to provide information. With this definition, a video game is not multimedia because it does not provide information, even though it is highly interactive. Video editing, even though it is interactive and deals with audio and video, is not multimedia because video editing is creating information, not supplying it. A good example of multimedia is an electronic encyclopedia. A student sits down at a computer, browses through a list of entries, and selects the one that is needed. A text passage is displayed on the screen along with a picture (the picture could be graphic based or a still or moving image). After reading for a while, the student clicks on the headphone icon to listen to an audio segment, which may contain a speech delivered by the person who is being researched. A click on a different icon produces a video clip showing this political leader in action at the last rally. All of the aspects described in the example are required for true multimedia. Accept no substitutes.

Noise

Any random fleck that shows up in the display. The noise may also be referred to as snow, flecks, blips, hash.

Noninterlaced

This is a method of scanning out a video display that is the total opposite of interlaced. All of the lines in the frame are scanned out sequentially, one right after the other. The term "field" does not apply in a noninterlaced system. Another term for a noninterlaced system is progressive scan.

NTSC

Never Twice the Same Color, Never The Same Color, or National Television Standards Committee, depending on who you're talking to. Technically, NTSC is just a color modulation scheme; to fully specify the color video signal it should be referred to as (M) NTSC. "NTSC" is also commonly (though incorrectly) used to refer to any 525/59.94 video system. See (M) NTSC.

OIRT

Organisation Internationale de Radiodiffision-Television.

PAL

PAL stands for Phase Alternation Line, Picture Always Lousy, or Perfect At Last depending on your viewpoint. Technically, PAL is just a color modulation scheme--PAL is to Europe as NTSC is to North America. To fully specify the color video signal it should be referred to as (B, D, G, H, I, M, N, or CN) PAL. (B, D, G, H, I) PAL is the color video standard used in Europe and many other countries. (M, N, CN) PAL is also used in a few places, but not as popular.
(B, D, G, H, I) PAL uses 625 lines per frame while (M) NTSC has 525 lines. Therefore, (B, D, G, H, I) PAL has higher vertical resolution. The frame rate of (M) NTSC is about 30 frames per second while for (B, D, G, H, I) PAL it is 25. This means the update rate for (M) NTSC is higher and therefore there is more flicker with (B, D, G, H, I) PAL. (B, D, G, H, I) PAL uses the Y'UV color space while (M) NTSC uses Y'IQ or Y'UV. That's no big deal, just a little mathematical difference. It is becoming increasingly important for video systems suppliers to produce equipment that can be sold worldwide without many manufacturing difficulties. This implies that the equipment must be designed from the start to accommodate both standards.
"PAL" is also commonly (though incorrectly) used to refer to any 625/50 video system.

PALplus, PAL+

PALplus (ITU-R BT.1197) is 16:9 aspect ratio version of PAL, and is compatible with standard (B, D, G, H, I) PAL. Normal (B, D, G, H, I) PAL video signals have 576 active scan lines. If a film is broadcast, usually 432 or fewer active scan lines are used. PALplus uses these unused "black" scan lines for additional picture information. The PALplus decoder mixes it with the visible picture, resulting in a 16:9 picture with the full resolution of 576 active scan lines. Widescreen TVs without the PALplus decoder, and standard (B, D, G, H, I) PAL TVs, show a standard picture with about 432 active scan lines.
PALplus is compatible with standard equipment. The number of pixels of a PALplus picture is the same as in (B, D, G, H, I) PAL, only the aspect ratio is different.

Pedestal

Pedestal is an offset used to separate the active video from the blanking level. When a video system uses a pedestal, the black level is above the blanking level by a small amount. When a video system doesn't use a pedestal, the black and blanking levels are the same. (M) NTSC uses a pedestal, (B, D, G, H, I) PAL does not.

Phase Adjust

This is a term used to describe a method of adjusting the color in a (M) NTSC video signal. The phase of the color subcarrier is moved, or adjusted, relative to the color burst. This adjustment affects the hue of the picture.

Phase Comparator

This is a circuit used in a PLL to tell how well two signals line up with each other. For example, let's say we have two signals, A and B, with signal A connected to the positive (+) input of the phase comparator and signal B connected to the minus (-) input. If both signals are exactly the same, the output of the phase comparator is 0; they are perfectly aligned. Now, if signal A is just a little bit faster than signal B, then the output of the phase comparator is a 1, showing that A is faster than B. If signal A is slower than B, then the output of the phase comparator is a -1, designating that B is faster. Read the Phase-Locked Loop definition to see how a phase comparator is used in a circuit.

Phase-Locked Loop

A phase-locked loop (PLL) is the heart of any genlocked system. Very simply, a PLL is a means of providing a very stable pixel clock that is based or referenced to some other signal. Let's say that we want to design a video system with a horizontal resolution of 100 pixels. Let's assume that, in order to get the 100 pixels across the display, if the horizontal sync rate were perfect, we would need a pixel clock of 5 MHz. If we didn't have a PLL and the horizontal rate were to shrink a little (the horizontal width gets smaller), we would get less than 100 pixels because we didn't adjust the pixel clock. Or, conversely, if the horizontal rate were to become a little longer (the image widens just a little), we would get more than 100 pixels. This is definitely bad news, because the time between horizontal syncs usually does vary just a tiny little bit, small enough that you may not notice it on your TV, but a computer would notice. So, from line to line, the number of pixels would change. A PLL guarantees that the same number of pixels appears on every line by changing the pixel clock frequency to match the horizontal sync rate. First, a voltage controlled oscillator (VCO) or voltage controlled crystal oscillator (VCXO) is used and the free-running frequency is set to the pixel clock rate needed if the horizontal rate was always to be perfect. The output of the VCO or VCXO is then used as the system pixel clock. This pixel clock is also used as the input to a circuit that takes the pixel clock frequency and divides it down to the horizontal sync frequency. So, at this point, we have a new signal whose frequency is the same as the frequency of horizontal sync. This newly generated signal, along with horizontal sync, are inputs to a phase comparator. The output of the phase comparator tells how well the output of the clock divider lines up with the incoming horizontal sync. The output of the phase comparator is fed to a loop filter to remove tiny little bumps that might throw the system out of whack. The output of the loop filter then becomes the control voltage for the VCO or VCXO. With this arrangement, if the incoming horizontal rate is just a little too fast, the phase comparator generates a signal that is then filtered and tells the VCO/VCXO to speed up a little bit. The VCO/VCXO does, which then speeds up the pixel clock just enough to ensure that the horizontal resolution is 100 pixels. This pixel clock is divided down to the horizontal sync rate and is then phase compared again.

Pixel

A pixel, which is short for picture element, is the smallest sample that makes up a scan line. For example, when the horizontal resolution is defined as 640 pixels, that means that there are 640 individual locations, or samples, that make up the horizontal scan line.
A "square pixel" is one that has equal vertical and horizontal sample spacing. Square pixels are used by computers, and the software expects the use of square pixels for proper operation. Typical square pixel resolutions are 640 x 480, 768 x 576, and 320 x 240.
A "rectangular pixel" is one that has different vertical and horizontal sample spacing. Rectangular pixels are usually used by consumer equipment and video conferencing. Typical rectangular pixel resolutions are 720 x 480, 720 x 576, 352 x 240, and 352 x 288.

Pixel Clock

The pixel clock is used to divide the incoming horizontal line of video into pixels. This pixel clock has to be stable (a very small amount of jitter) relative to the incoming video or the picture will not be stored correctly. The higher the frequency of the pixel clock, the more pixels that will appear across the screen.

Pixel Drop Out

This can be a real troublemaker, since it can cause image artifacts. In some instances, a pixel drop out looks like black spots on the screen, either stationary or moving around. Several things can cause pixel drop out, such as the ADC not digitizing the video correctly. Also, the timing between the ADC and the frame buffer might not be correct, causing the wrong number to be stored in the buffer. For that matter, the timing anywhere in the video stream might cause a pixel drop out.

PLL

See Phase-Locked Loop.

Primary Colors

A set of colors that can be combined to produce any desired set of intermediate colors, within a limitation call the "gamut". The primary colors for color television are red, green, and blue.

Pseudo Color

Pseudo color is a term used to describe a technique that applies color, or shows color, where it does not really exist. We are all familiar with the satellite photos that show temperature differences across a continent or the multicolored cloud motion sequences on the nightly weather report. These are real-world examples of pseudo color. The color does not really exist. The computer uses a lookup table RAM to add the color so information, such as temperature or cloud height, is viewable.

Px64

This is basically the same as H.261. The term is starting to fade away since H.261 is used in applications other than ISDN video conferencing.

QCIF

Quarter Common Interface Format. This video format was developed to allow the implementation of cheaper video phones. The QCIF format has a resolution of 176 x 144 active pixels and a refresh rate of 29.97 frames per second.

QSIF

The computer industry, which uses square pixels, has defined QSIF to be 160 x 120 (NTSC) or 192 x 144 (PAL) active pixels, with a refresh rate of whatever the computer is capable of supporting.

Quad Chroma

Quad chroma refers to a technique where the pixel clock is four times the frequency of the chroma burst. For (M) NTSC this means that the pixel clock is 14.32 MHz (4 x 3.579545 MHz), while for (B, D, G, H, I) PAL the pixel clock is 17.73 MHz (4 x 4.43361875 MHz). The reason these are popular pixel clock frequencies is that, depending on the method chosen, they make the chrominance (color) decoding easier.

Quadrature Modulation

The modulation of two carrier components, which are 90 degrees apart in phase, by separate modulating functions.

Quantization

The process of converting a continuous analog signal into a set of discrete levels (digitizing).

Quantization Noise

Also called quantization distortion. This is the inherent uncertainty introduced during quantization since only discrete, rather than continuous, levels are generated.

Raster

Essentially, a raster is the series of scan lines that make up a TV picture or a computer's display. You may from time to time hear the term raster line-it's the same asscan line. All of the scan lines that make up a frame of video form a raster.

RC Time Code

Rewritable time code, used in consumer video products.

Real Time

If a system incorporating a computer operates fast enough that it seems like there isn't a computer in the loop, then that computer system is operating in real time. How fast "real time" really is changes depending on who or what is using the system. For example, a fighter pilot flying the latest computer-controlled jet moves the stick to perform a roll maneuver. The stick then tells a computer its position, the computer makes some decisions, and then it tells the flaps and rudder what adjustments to make to perform the move. Since all of this happens fast enough so that the pilot thinks the stick is connected directly to the flaps and rudder, the plane is a real-time system.
What's the definition of real time for video? Well, for (M) NTSC that's about 30 frames per second, with each frame made up of 525 individual scan lines. That's roughly equivalent to 30 MB of data per second that must be processed.

Rectangular Pixels

Consumer displays currently use rectangular pixels, where the horizontal and vertical sample pitch are different. The most common rectangular pixel format isBT.601.

Residual Subcarrier

This is the amount of color subcarrier information in the color data after decoding a composite color video signal. The number usually appears as -n dB. The larger"n" is, the better.
Resistor Ladder

A resistor ladder is a string of resistors used for defining voltage references. In the case of 8-bit flash ADCs, the resistor ladder is made up of 256 individual resistors, each having the same resistance. If a voltage representing the number 1 is attached to one end of the ladder and the other end is attached to 0, each junction between resistors is different from the other by 1/256. So, if we start at the top of the ladder, the value is 1. If we move down one rung, the value is 0.99609, the next rung's value is 0.99219, the next rung's is 0.98828 and so on down the ladder until we reach 0 (the other end of the ladder). A resistor ladder is an important part of a flash ADC because each rung of the ladder, or tap, is connected to one side of a comparator, in effect providing 256 references. The definition of flash ADCs helps out here.

Resolution

VIDEO RESOLUTION is usually described in terms of luminance and chrominance bandwidth. Resolution can vary horizontally (from about 180 resolvable lines for VHS to 800 lines for a very good broadcast video monitor or camera) but remains constant vertically (486 visible lines in video).

RESOLUTION - The density of lines or dots that make up an image. Resolution determines the detail and quality in the image.

A) A measure of the ability of a camera or television system to reproduce detail.

B) In video, generally called horizontal resolution. It can be evaluated by establishing the limit to which lines can be distinguished on a test pattern. A larger resolution value means a broader frequency band of the video signal.

C) A measure of the greatest amount of detail that can be seen in an image. Often incorrectly expressed as a number of pixels in a given line; more correctly it is the bandwidth.

D) This is a basic measurement of how much information is on the screen. It is usually described as "some number" by "some number". The first "some number" is the horizontal (across the screen) resolution and the second "some number" is the vertical resolution (down the screen). The higher the number, the better, since that means there's more detail to see. Some typical examples:

NTSC VHS: 240 x 485
NTSC broadcast: 330 x 485
NTSC laserdisc: 400 x 485
ITU-R BT.601 (525/60): 720 x 485
Computer screen: 1280 x 1024

Retrace

Retrace is what the electron beam does when it gets to the right-hand edge of the display to get back to the left-hand edge. Retrace happens during the blanking time.

RGB

Abbreviation for red, green, blue.

RS-170, SMPTE 170M

RS-170 is the United States standard that was used for black-and-white TV, and defines voltage levels, blanking times, the width of the sync pulses, and so forth. The specification spells out everything required for a receiver to display a monochrome picture. The output of those little black-and-white security cameras hanging from ceilings conforms to the RS-170 specification. Now, SMPTE 170M is essentially the same specification, modified for color TV by adding the color components. They modified RS-170 just a tiny little bit so that color could be added, with the result being called SMPTE 170M. This tiny little change was so small that the existing black-and-white TVs didn't even notice it.

RS-343

RS-343 does the same thing as RS-170, defining a specification for video, but the difference is that RS-343 is for higher-resolution video (computers) while RS-170 is for lower-resolution video (TV).

Run Length Coding

Run length coding is a type of data compression. Let's say that this page is wide enough to hold a line of 80 characters. Now, imagine a line that is almost blank except for a few words. It's 80 characters long, but it's just about all blanks-let's say 50 blanks between the words "coding" and "medium". These 50 blanks could be stored as 50 individual codes, but that would take up 50 bytes of storage. An alternative would be to define a special code that said a string of blanks is coming and the next number is the amount of blanks in the string. So, using our example, we would need only 2 bytes to store the string of 50 blanks, the first special code byte followed by the number 50. We compressed the data; 50 bytes down to 2. This is a compression ration of 25:1. Not bad, except that we only compressed one line out of this entire document, so we should expect that the total compression ratio would be much less.
Run length coding all by itself as applied to images is not as efficient as using a DCT for compression, since long runs of the same "number" or series rarely exist in real-world images. The only advantage of run length coding over the DCT is that it is easier to implement. Even though run length coding by itself is not efficient for compressing images, it is used as part of the JPEG, MPEG, H.261, and H.263 compression schemes.

R'-Y'

In color television, the red-minus-luma signal, also called a color difference signal. When added to the luma (Y') signal, it produces the red primary signal.

SABC

South Africa Broadcasting Corporation.

SVHS, S-VHS

S-VHS is an enhancement to regular VHS video tape decks. S-VHS provides better resolution and less noise than VHS. S-VHS video tape decks support separate luma (Y') and chroma (C) video inputs and outputs, although this is not required. It does, however, improve the quality by not having to continuously merge and then separate the luma and chroma signals.

S-Video

Separate Video, also called Y/C video.

Sample

To obtain values of a signal at periodic intervals. Also the value of a signal at a given moment in time.

Sample and Hold

A circuit that samples a signal and holds the value until the next sample is taken.

Sample Rate

Sample rate is how often the ADC will take a sample of the video. The sample rate is determined by the pixel clock.

SAP

Abbreviation for secondary audio program. Generally used to transmit audio in a second language.

Saturation

Saturation is the amount of color present. For example, a lightly saturated red looks pink, while a fully saturated red looks like the color of a red crayon. Saturation does not mean the brightness of the color, just how much "pigment" is used to make the color. The less "pigment", the less saturated the color is, effectively adding white to the pure color.

Scaling

Scaling is the act of changing the effective resolution of the image. For example, let's take a TV size resolution of 640 x 480 and display that image as a smaller picture on the same screen, so that multiple pictures can be shown simultaneously. We could scale the original image down to a resolution of 320 x 240, which is ¼ of the original size. Now, four pictures can be shown at the same time. That was an example of "scaling down". Scaling up is what occurs when a snapshot is enlarged into an 8" x 10" glossy. There are many different methods for image scaling, and some "look" better than others. In general, though, the better the algorithm "looks", the harder or more expensive it is to implement.

Scan Line

A scan line is an individual sweep across the face of the display by the electron beam that makes the picture. An example of a scan line is what happens in a copier. When you press the copy button, a mirror "scans" the document by moving across the length of the page. Same concept with television-an electron beam "scans" the screen to produce the image on the display. It takes 525 of these scan lines to make up a NTSC TV picture.

SCART

This is a 21-pin connector supported by many consumer audio/video components in Europe. It allows mono or stereo audio, composite video, s-video, and RGB video to be transmitted between equipment.

SECAM

This is another color TV format similar to PAL. The major differences between the two are that in SECAM the chroma is FM modulated and the R'-Y' and B'-Y' signals are transmitted line sequentially. SECAM stands for Sequentiel Couleur Avec Memoire or Sequential Color with Memory.

Secondary Audio Program

See SAP.

Serration Pulses

These are pulses that occur during the vertical sync interval, at twice the normal horizontal scan rate. The reason these exist was to ensure correct 2:1 interlacing in early televisions, and eliminate DC offset build-up.

Setup

Setup is the same thing as Pedestal.

SIF

Standard (or Source) Input Format. This video format was developed to allow the storage and transmission of digital video. The 625/50 SIF format has a resolution of 352 x 288 active pixels and a refresh rate of 25 frames per second. The 525/59.94 SIF format has a resolution of 352 x 240 active pixels and a refresh rate of 29.97 frames per second. Note that MPEG 1 allows resolutions up to 4095 x 4095 active pixels, however, there is a "constrained subset" of parameters defined as SIF. The computer industry, which uses square pixels, has defined SIF to be 320 x 240 active pixels, with a refresh rate of whatever the computer is capable of supporting.

Signal-to-Noise Ratio, SNR

Signal-to-noise ratio is the magnitude of the signal divided by the amount of unwanted stuff that is interfering with the signal (the noise). SNR is usually described in decibels, or "dB", for short; the bigger the number, the better looking the picture.

Silent Radio

Silent Radio is a service that feeds data that is often seen in hotels and bars. It's usually a large red sign that shows current news, events, scores, etc. It is present on(M) NTSC lines 10, 11, 273, and 274, and uses encoding similar to EIA-608.

SMPTE 170M

This SMPTE standard defines the (M) NTSC composite color video signal. Also see RS-170.

Split Sync Scrambling

Split sync is a video scrambling technique, usually used with either horizontal blanking inversion, active video inversion, or both. In split sync, the horizontal sync pulse is "split", with the second half of the pulse at +100 IRE instead of the standard -40 IRE. Depending on the scrambling mode, either the entire horizontal blanking interval is inverted about the +30 IRE axis, the active video (after color burst and until the beginning of front porch blanking) is inverted about the +30 IRE axis, both are inverted, or neither is inverted. By splitting the horizontal sync pulse, a reference of both -40 IRE and +100 IRE is available to the descrambler. Since a portion of the horizontal sync is still at -40 IRE, some sync separators may still lock on the shortened horizontal sync pulses. However, the timing circuits that look for color burst a fixed interval after the beginning of horizontal sync may be confused. In addition, if the active video is inverted, some video information may fall below 0 IRE, possibly confusing sync detector circuits. The burst is always present at the correct frequency and timing, however, the phase is shifted 180 degrees when the horizontal blanking interval is inverted.

Square Pixels

Computer monitors use square pixels, where the horizontal and vertical sample pitch are the same.

Starsight

A national electronic "TV Guide look-alike" service that you subscribe to. It allows you to sort the guide by your order of preference and delete stations you never watch. It's a national service, that is regionalized. The decoders in Houston only download data for Houston. Move to Dallas and you only get Dallas. It is present on (M) NTSC lines 14 and 277, and uses encoding similar to EIA-608.

Subcarrier

A secondary signal containing additional information that is added to a main signal.

Subsampled

Subsampled means that a signal has been sampled at a lower rate than some other signal in the system. A prime example of this is the Y'CbCr color space used in ITU-R BT.601. For every two luma (Y') samples, only one Cb and Cr sample is taken. This means that the Cb and Cr signals are subsampled.

Super Black

A keying signal that is embedded within the composite video signal as a level between black and sync. It is usually used to improve luma self-keying because the video signal contains black, making a good luma self-key hard to implement. Where the downstream keyer detects the super black level, it inserts the second composite video signal.

Sync

Sync is a fundamental, you gotta have it, piece of information for displaying any type of video. This goes for TVs, workstations, or PCs. Essentially, the sync signal tells the display where to put the picture. The horizontal sync, or HSYNC for short, tells the display where to put the picture in the left-to-right dimension, while the vertical sync (VSYNC) tells the display where to put the picture from top-to-bottom.

Sync Generator

A sync generator is a circuit that provides sync signals. A sync generator may have genlock capability, or it may not.

Sync Noise Gate

A sync noise gate is used to define an area within the video waveform where the sync stripper is to look for the sync pulse. Anything outside of this defined window will be rejected by the sync noise gate and won't be passed on to the sync stripper. The main purpose of the sync noise gate is to make sure that the output of the sync stripper is nice, clean, and correct.

Sync Stripper

A composite video signal contains video information, which is the picture to be displayed, and timing (sync) information that tells the receiver where to put this video information on the display. A sync stripper pulls out the sync information from the composite video signal and throws the rest away.

Synchronous

Refers to two or more events that happen in a system or circuit at the same time.

TDF

Telediffusion de France.

Tessellated Sync

This is what the Europeans call serrated sync. See the definitions of Serration Pulses and Composite Sync.

Timebase Corrector

Certain video sources have their sync signals screwed up. The most common of these sources is the VCR. A timebase corrector "heals" a video signal that has bad sync. (I guess you could call a timebase corrector a "sync doctor".) This term is included because more and more companies making video capture cards are providing this function.

True Color

True color means that each pixel in an image is individually represented using three color components, such as RGB or Y'CbCr. In addition, the color components of each pixel may be independently modified.

Underscan

Most televisions use overscanning, resulting in some of the video being lost beyond the edges of the screen. Underscanning modifies the video timing so that the entire video signal appears in a rectangle centered on the television screen with a black border. The resolutions for square-pixel underscan and overscan images are:

NTSC overscan: 640 x 480
NTSC underscan: 512 x 384
PAL overscan: 768 x 576
PAL underscan: 640 x 480

Uplink

The carrier used by Earth stations to transmit information to a satellite.

VBI

See Vertical Blanking Interval.

Vectorscope

A vector scope is used to determine the color purity of a (M) NTSC or (B, D, G, H, I) PAL video system. If you've read the Y'IQ or Y'UV definitions, then you know that the I and Q (or U and V) components are the axis of a Cartesian coordinate system. The vector scope is essentially a Cartesian coordinate display scope. The vector scope looks at the I and Q signals and puts a point of light where the two signals say the color is. On a vector scope, six little boxes correspond to the six colors in the standard color bar pattern: yellow, cyan, magenta, green, red, and blue. If the input to the video system is a color bar pattern from a test generator and the output is displayed on a vector scope, then the accuracy of the color system can be checked. Each point of light that represents the corresponding color should be within the little box- certainly, the closer the better. If the spot makes it within the little box, that represents an error of less than +/-2 degrees. That means you can't notice the error with your eyeball.

Vertical Blanking Interval

During the vertical blanking interval, the video signal is at the blank level so as not to display the electron beam when it sweeps back from the bottom to the top side of the screen.

Vertical Interval Timecode

See VITC.

Vertical Scan Rate

For non-interlaced video, this is the same as the Frame Rate. For interlaced video, this is usually considered to be twice the frame rate.

Vertical Sync

This is the portion of the composite video signal that tells the receiver where the top of the picture is.

Video Carrier

A specific frequency that is modulated with video data before being mixed with the audio data and transmitted.

Video CD

Standard compact discs that hold up to about an hour of digital audio and video information. The audio and video are compressed and stored using MPEG 1.

Video Mixing

Video mixing is taking two independent video sources and merging them together.

Video Modulation

Converting a baseband video signal to an RF signal.

Video Module Interface

A standard video interface designed to simplify interfacing video ICs together. It is based on the Philips SAA7111 output interface and timing. See the VMI overview.

Video Program System

See VPS.

Video Quality

Video quality is a phrase that means "how good does the picture look?". A video image that has a high signal-to-noise ratio and is free of any image artifacts has high image quality. The typical VCR has marginal image quality.

Video Waveform

The video waveform is what the signal "looks" like to the receiver or TV. The video waveform is made up of several parts (sync, blanking, video, etc.) that are all required to make up a TV picture that can be accurately displayed.

VITC

Vertical Interval Time Code. Timecode information stored on specific scan lines during the vertical blanking interval.

VMI

See Video Module Interface.

Voltage Controlled Crystal Oscillator, VCXO

A VCXO is just like a voltage-controlled oscillator except that a VCXO uses a crystal to set the free-running frequency. This means that a VCXO is more stable than a VCO but it's also more expensive to implement.

Voltage Controlled Oscillator, VCO

A VCO is a special type of oscillator that changes its frequency depending on a control signal, usually a voltage. A VCO has what's called a free-running frequency which is the frequency that the oscillator runs at when the control voltage is at midrange, normal operating condition. If the control voltage rises above midrange, the VCO increases the frequency of the output clock, and if the control voltage falls below midrange, then the VCO lowers the frequency of the output clock. See the definition of a Phase-Locked Loop.

VPS

Video Program System used in Germany. Information is included in the video signal to automatically control VCRs.

White Level

This level defines what white is for the particular video system.

WSS

Wide Screen Signalling. It is used on (B, D, G, H, I) PAL scan line 23 to specify several new PAL video signal formats. WSS can tell the TV if PALplus processing is to be done, whether the signal is "Film Mode" or "Camera Mode", whether PAL clean encoding was performed, the aspect ratio, type of subtitles, etc.

Y/C Video

The Y/C designation is shorthand for luma (Y') and chroma (C). You will also see this term used in the description of the S-VHS video tape format.

Y/C Separator

A Y/C separator is what's used in a decoder to pull the luma and chroma apart in an (M) NTSC or (B, D, G, H, I) PAL system. This is the first thing that any color TV must do. The composite video signal is first fed to the Y/C separator so that the chroma can then be decoded further.

YCbCr

Y'CbCr is the color space defined by Recommendation ITU-R BT.601. Y' is the luma component and the Cb and Cr components are color difference signals. Cb and Cr are scaled versions of U and V in the Y'UV color space. The technically-correct notation is Y'Cb'Cr' since all three components are derived from R'G'B. Many people use the YCbCr notation rather than Y'CbCr or Y'Cb'Cr'. 4:2:2 Y'CbCr means that Y' has been sampled at 13.5 MHz, while Cb and Cr were each sampled at 6.75 MHz. Thus, for every two samples of Y', there is one sample each of Cb and Cr. 4:1:1 Y'CbCr means that Y' has been sampled at 13.5 MHz, while Cb and Cr were each sampled at 3.375 MHz. Thus, for every four samples of Y', there is one sample each of Cb and Cr. 2:1:1 Y'CbCr means that Y' has been sampled at 6.75 MHz, while Cb and Cr were each sampled at 3.375 MHz. Thus, for every two samples of Y', there is one sample each of Cb and Cr.

Y'IQ

Y'IQ is the color space used in the (M) NTSC color system. The Y' component is the black-and-white portion of the image. The I and Q parts are the color difference components; these are effectively nothing more than a "watercolor wash" placed over the black and white, or luma, component. Many people use the YIQ notation rather than Y'IQ or Y'I'Q'. The technically-correct notation is Y'I'Q' since all three components are derived from R'G'B.

Y'UV

Y'UV is the color space used by the PAL color system (it may also be used in the NTSC system). As with the Y'IQ color space, the Y' is the luma component while the U and V are the color difference components. Many people use the Y'UV notation when they actually mean Y'CbCr data. Many people use the YUV notation rather than Y'UV or Y'U'V'. The technically-correct notation is Y'U'V' since all three components are derived from R'G'B.

YUV9

Intel's compressed Y'UV format, providing a compression ratio of up to 3:1. The picture is divided into blocks, with each block comprising 4 x 4 pixels. For each block, 16 values of Y', one value of U, and one value of V are assigned.

Zeroing

Zeroing is what's done to the bank of comparators in a CMOS flash ADC to keep them accurate. Without zeroing, the comparators build up enough of an error that the output of the flash ADC would not be correct any more. To solve the problem, the comparators are "zeroed", or the accumulated error is removed.

Zipper

See the definition for creepy-crawlies.

Zoom

Zoom is a type of image scaling. Zooming is making the picture larger so that you can see more detail. The examples described in the definition of scaling are also examples that could be used here.

From Video Demystified